Carrier
TRANSICOLD

Container Refrigeration

OPERATIONS AND SERVICE MANUAL

For

69NT40-561-300 to 399

Container Refrigeration Units

T-365 Rev D

Carrier
TRANSICOLD

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SECTION 1

SAFETY SUMMARY

1.1 General Safety Notices

Installation and servicing of refrigeration equipment can be hazardous due to system pressures and electrical components. Only trained and qualified service personnel should install, repair, or service refrigeration equipment. When working on refrigeration equipment, observe all potential Danger, Warning and Caution hazards, including those shown below and on hazard labels attached to the unit.

The following general safety notices supplement specific warnings and cautions appearing elsewhere in this manual. They are recommended precautions that must be understood and applied during operation and maintenance of the equipment covered herein. The general safety notices are presented in the following three sections labeled: First Aid, Operating Precautions and Maintenance Precautions. A listing of the specific warnings and cautions appearing elsewhere in the manual follows the general safety notices.

1.2 First Aid

An injury, no matter how slight, should never go unattended. Always obtain first aid or medical attention immediately.

1.3 Operating Precautions

Always wear safety glasses.

Keep hands, clothing and tools clear of the evaporator and condenser fans.

Wear appropriate personal protective equipment for the work being undertaken.

No work should be performed on the unit until all circuit breakers and start-stop switches are turned off, and power supply is disconnected.

In case of severe vibration or unusual noise, stop the unit and investigate.

1.4 Maintenance Precautions

Beware of unannounced starting of the evaporator and condenser fans. Do not remove the condenser fan grille or evaporator access panels before turning power off, disconnecting and securing the power plug.

Be sure power is turned off before working on motors, controllers, solenoid valves and electrical control switches. Tag circuit breaker and power supply to prevent accidental energizing of circuit.

Do not bypass any electrical safety devices, e.g. bridging an overload, or using any sort of jumper wires. Problems with the system should be diagnosed, and any necessary repairs performed by qualified service personnel.

When performing any arc welding on the unit or container, disconnect all wire harness connectors from the modules in control boxes. Do not remove wire harness from the modules unless you are grounded to the unit frame with a static safe wrist strap.

In case of electrical fire, open circuit switch and extinguish with CO_2 (never use water).

1.5 Specific Hazard Statements

To help identify the label hazards on the unit and explain the level of awareness each one carries, an explanation is given with the appropriate consequences:

⚠ DANGER

Means an immediate hazard that WILL result in severe personal injury or death.

⚠ WARNING

Means to warn against hazards or unsafe conditions that COULD result in severe personal injury or death.

⚠ CAUTION

Means to warn against potential hazard or unsafe practice that could result in personal injury, product or property damage.

The statements listed below are applicable to the refrigeration unit and appear elsewhere in this manual. These recommended precautions must be understood and applied during operation and maintenance of the equipment covered herein.

⚠ WARNING

EXPLOSION HAZARD: Failure to follow this WARNING can result in death, serious personal injury and / or property damage. Never use air or gas mixtures containing oxygen (O_2) for leak testing or operating the product. Charge Only With R−134a: Refrigerant must conform to AHRI Standard 700 specification.

⚠ WARNING

Beware of unannounced starting of the evaporator and condenser fans. The unit may cycle the fans and compressor unexpectedly as control requirements dictate.

⚠ WARNING

Do not attempt to remove power plug(s) before turning OFF start-stop switch (ST), unit circuit breaker(s) and external power source.

⚠ WARNING

Make sure the power plugs are clean and dry before connecting to power receptacle.

⚠ WARNING

Make sure that the unit circuit breaker(s) (CB-1 & CB-2) and the START-STOP switch (ST) are in the “O” (OFF) position before connecting to any electrical power source.

⚠ WARNING

Make sure power to the unit is OFF and power plug disconnected before replacing the compressor.

⚠ WARNING

Before disassembly of the compressor, be sure to relieve the internal pressure very carefully by slightly loosening the couplings to break the seal.

⚠ WARNING

Do not use a nitrogen cylinder without a pressure regulator.

⚠ WARNING

Do not remove the condenser fan grille before turning power OFF and disconnecting power plug.

⚠ WARNING

Oakite No. 32 is an acid. Be sure that the acid is slowly added to the water. DO NOT PUT WATER INTO THE ACID - this will cause spattering and excessive heat.

⚠ WARNING

Wear rubber gloves and wash the solution from the skin immediately if accidental contact occurs. Do not allow the solution to splash onto concrete.

⚠ WARNING

Always turn OFF the unit circuit breakers (CB-1 & CB-2) and disconnect main power supply before working on moving parts.

⚠ WARNING

Installation requires wiring to the main unit circuit breaker, CB1. Make sure the power to the unit is off and power plug disconnected before beginning installation.

⚠ CAUTION

Charge water-cooled condenser or receiver according to nameplate specifications to ensure optimal unit performance.

⚠ CAUTION

Do not remove wire harnesses from circuit boards unless you are grounded to the unit frame with a static safe wrist strap or equivalent static drain device.

⚠ CAUTION

Remove the controller module and unplug all connectors before performing any arc welding on any part of the container.

⚠ CAUTION

Do not attempt to use an ML2i PC card in an ML3 equipped unit. The PC cards are physically different and will result in damage to the controller.

⚠ CAUTION

Pre-trip inspection should not be performed with critical temperature cargoes in the container.

⚠ CAUTION

When Pre-Trip key is pressed, economy, dehumidification and bulb mode will be deactivated. At the completion of Pre-Trip activity, economy, dehumidification and bulb mode must be reactivated.

⚠ CAUTION

When condenser water flow is below 11 lpm (3 gpm) or when water-cooled operation is not in use, the CFS switch MUST be set to position “1” or the unit will not operate properly.

⚠ CAUTION

When a failure occurs during automatic testing, the unit will suspend operation awaiting operator intervention.

⚠ CAUTION

When Pre-Trip test Auto 2 runs to completion without being interrupted, the unit will terminate pre-trip and display “Auto 2” “end.” The unit will suspend operation until the user depresses the ENTER key!

⚠ CAUTION

Allowing the scroll compressor to operate in reverse for more than two minutes will result in internal compressor damage. Turn the start-stop switch OFF immediately.

⚠ CAUTION

To prevent trapping liquid refrigerant in the manifold gauge set be sure set is brought to suction pressure before disconnecting.

⚠ CAUTION

The scroll compressor achieves low suction pressure very quickly. Do not use the compressor to evacuate the system below 0 psig. Never operate the compressor with the suction or discharge service valves closed (front-seated). Internal damage will result from operating the compressor in a deep vacuum.

⚠ CAUTION

The PrimeLINE unit has a hermetically sealed compressor that should not be opened and/or repaired. Doing so can cause a loss in performance and premature system failure due to the precision machinery and assembly required within the compressor. To repair the unit, remove the faulty compressor and replace with an approved Carrier compressor. If the return of the compressor is not required, follow local waste collection & recycling regulations in discarding the compressor.

⚠ CAUTION

Take necessary steps (place plywood over coil or use sling on motor) to prevent motor from falling into condenser coil.

⚠ CAUTION

The unit must be OFF whenever a programming card is inserted or removed from the controller programming port.

⚠ CAUTION

Use care when cutting wire ties to avoid nicking or cutting wires.

⚠ CAUTION

Do not allow moisture to enter wire splice area as this may affect sensor resistance.

SECTION 2

INTRODUCTION

2.1 Introduction

The Carrier Transicold model 69NT40-561-300 through 399 series units are of lightweight aluminum frame construction, designed to fit in the front of a container and serve as the container’s front wall.

They are one piece, self-contained, all electric units, which include cooling and heating systems to provide precise temperature control.

The units are supplied with a complete charge of refrigerant R-134a and compressor lubricating oil, and are ready for operation upon installation. Forklift pockets are provided for unit installation and removal.

The base unit operates on nominal 380/460 volt, 3-phase, 50/60 hertz (Hz) power. An optional autotransformer may be fitted to allow operation on nominal 190/230, 3-phase, 50/60 Hz power. Control system power is provided by a transformer which steps the supply power down to 18 and 24 volts, single phase.

The controller is a Carrier Transicold Micro-Link 3 microprocessor. The controller operates automatically to select cooling, holding or heating as required to maintain the desired set point temperature within very close limits.

The controller has a keypad and display for viewing or changing operating parameters. The display is also equipped with lights to indicate various modes of operation.

2.2 Configuration Identification

Unit identification information is provided on a plate located on the back wall of the condenser section. The plate provides the unit model number, the unit serial number and the unit parts identification number (PID). The model number identifies the overall unit configuration, while the PID number provides information on specific optional equipment, factory provisioned to allow for field installation of optional equipment and differences in detailed parts.

2.3 Feature Descriptions

2.3.1 Control Box

Units are equipped with an aluminum control box, and may be fitted with a lockable door.

2.3.2 Temperature Readout

The unit is fitted with suction and discharge refrigerant temperature sensors. The sensor readings may be viewed on the controller display.

2.3.3 Pressure Readout

The unit is fitted with evaporator, suction, and discharge pressure transducers. The transducer readings may be viewed on the controller display.

2.3.4 Compressor

The unit is fitted with a scroll compressor equipped with suction and discharge service connections.

2.3.5 Condenser Coil

The unit is fitted with a two-row square formed condenser coil using 7mm tubing.

2.3.6 Condenser Fan Operation

Units are equipped with a three phase, dual speed condenser fan motor. Opening of condenser fan motor internal protector will stop the fan motor and the controller will subsequently shut down the compressor.

2.3.7 Evaporator

The evaporator section is equipped with an electronic expansion valve (EEV).

2.3.8 Evaporator Fan Operation

Units are equipped with three-phase evaporator fan motors. Opening of an evaporator fan internal protector will shut down the unit.

2.3.9 Plate Set

Each unit is equipped with a tethered set of wiring schematics and wiring diagram plates. The plate sets are ordered using a seven-digit base part number and a two-digit dash number.

2.4 Option Descriptions

Various options may be factory or field equipped to the base unit. These options are described in the following sub-paragraphs.

2.4.1 Battery

The refrigeration controller may be fitted with standard replaceable batteries or a rechargeable battery pack. Rechargeable battery packs may be fitted in the standard location or in a secure location.

2.4.2 Dehumidification

The unit may be fitted with a humidity sensor. This sensor allows setting of a humidity set point in the controller. In dehumidification mode, the controller will operate to reduce internal container moisture level.

2.4.3 USDA

The unit may be supplied with fittings for additional temperature probes, which allow recording of USDA Cold Treatment data by the integral DataCORDER function of the Micro-Link refrigeration controller.

2.4.4 Interrogator

Units that use the DataCORDER function are fitted with interrogator receptacles for connection of equipment to download the recorded data. Two receptacles may be fitted; one is accessible from the front of the container and the other is mounted inside the container (with the USDA receptacles).

2.4.5 Remote Monitoring

The unit may be fitted with a remote monitoring receptacle. This item allows connection of remote indicators for COOL, DEFROST and IN RANGE. Unless otherwise indicated, the receptacle is mounted at the control box location.

2.4.6 Quest - CCPC

Compressor-Cycle Perishable Cooling (CCPC) is a method of temperature control used during steady-state perishable cooling that cycles the compressor on and off according to supply / return air temperature conditions.

2.4.7 Communications Interface Module

The unit may be fitted with a communications interface module. The communications interface module is a slave module which allows communication with a master central monitoring station. The module will respond to communication and return information over the main power line. Refer to the ship master system technical manual for further information.

2.4.8 Autotransformer

An autotransformer may be provided to allow operation on 190/230, 3-phase, 50/60 Hz power. The autotransformer raises the supply voltage to the nominal 380/460 volt power required by the base unit. The autotransformer may also be fitted with an individual circuit breaker for the 230 volt power.

If the unit is equipped with an autotransformer and communications module, the autotransformer will be fitted with a transformer bridge unit (TBU) to assist in communications.

2.4.9 Gutters

Rain gutters may be fitted over the control box to divert rain away from the controls.

2.4.10 Handles

The unit may be equipped with handles to facilitate access to stacked containers. These fixed handles are located on either side of the unit.

2.4.11 Thermometer Port

The unit may be fitted with ports in the front of the frame for insertion of a thermometer to measure supply and/or return air temperature. If fitted, the port(s) will require a cap and chain.

2.4.12 Back Panels

Aluminum back panels may have access doors and/or hinge mounting.

2.4.13 460 Volt Cable

Various power cable and plug designs are available for the main 460 volt supply. The plug options tailor the cables to each customer's requirements.

2.4.14 230 Volt Cable

Units equipped with an autotransformer require an additional power cable for connection to the 230 volt source. Various power cable and plug designs are available. The plug options tailor the cables to each customer's requirements.

2.4.15 Cable Restraint

Various designs are available for storage of the power cables. These options are variations of the compressor section cable guard.

2.4.16 Upper Air (Fresh Air Make Up)

The unit may be fitted with an upper fresh air makeup assembly. The fresh air makeup assembly is available with a vent positioning sensor (VPS) and may also be fitted with screens.

2.4.17 Lower Air (Fresh Air Make Up)

The unit may be fitted with a lower fresh air makeup assembly. The fresh air makeup assembly is available with a vent positioning sensor (VPS) and may also be fitted with screens.

2.4.18 Labels

Safety Instruction and Function Code listing labels differ depending on the options installed. Labels available with additional languages are listed in the parts list.

2.4.19 Controller

Two replacement controllers are available:

1. Re-manufactured - Controller is the equivalent of a new OEM controller and is supplied with a 12-month warranty.
2. Repaired - Controller has had previous faults repaired and upgraded with the latest software.

NOTICE

Repaired controllers are NOT to be used for warranty repairs; only full OEM Re-manufactured controllers are to be used.

Controllers will be factory-equipped with the latest version of operational software, but will NOT be configured for a specific model number and will need to be configured at the time of installation or sale.

2.4.20 Condenser Grille

Condenser grilles are direct bolted.

2.4.21 XtendFRESH

XtendFRESH™ is an OEM option that helps slow the ripening process by removing ethylene and simultaneously controlling CO_2 and O_2 levels in multiple combinations.

Procedures and technical information related to the XtendFRESH™ controlled atmosphere system can be found in the **T-366 XtendFRESH Manual**, located in the Literature section of the Container Refrigeration website. To find the manual from the Literature section, click on Options > XtendFRESH.

2.4.22 TripWise

TripWise™ is a new premium option available for PrimeLINE units. TripWise is software logic that runs in the background during every voyage and will let you know whenever a standard pre-trip inspection (PTI) is needed.

2.4.23 FuelWise

FuelWise™ is a power-saving option available for PrimeLINE units. FuelWise software works by dynamically cycling the refrigeration system on and off to save energy while still maintaining temperature within +/- 0.25 degrees Celsius of setpoint on an hourly average.

2.4.24 QUEST

QUEST (Quality and Energy Efficiency in Storage and Transport) power-saving mode available for PrimeLINE units. QUEST reduces energy requirements by up to 50 percent while reducing emissions related to power consumption.

SECTION 3

DESCRIPTION

3.1 General Description

3.1.1 Refrigeration Unit - Front Section

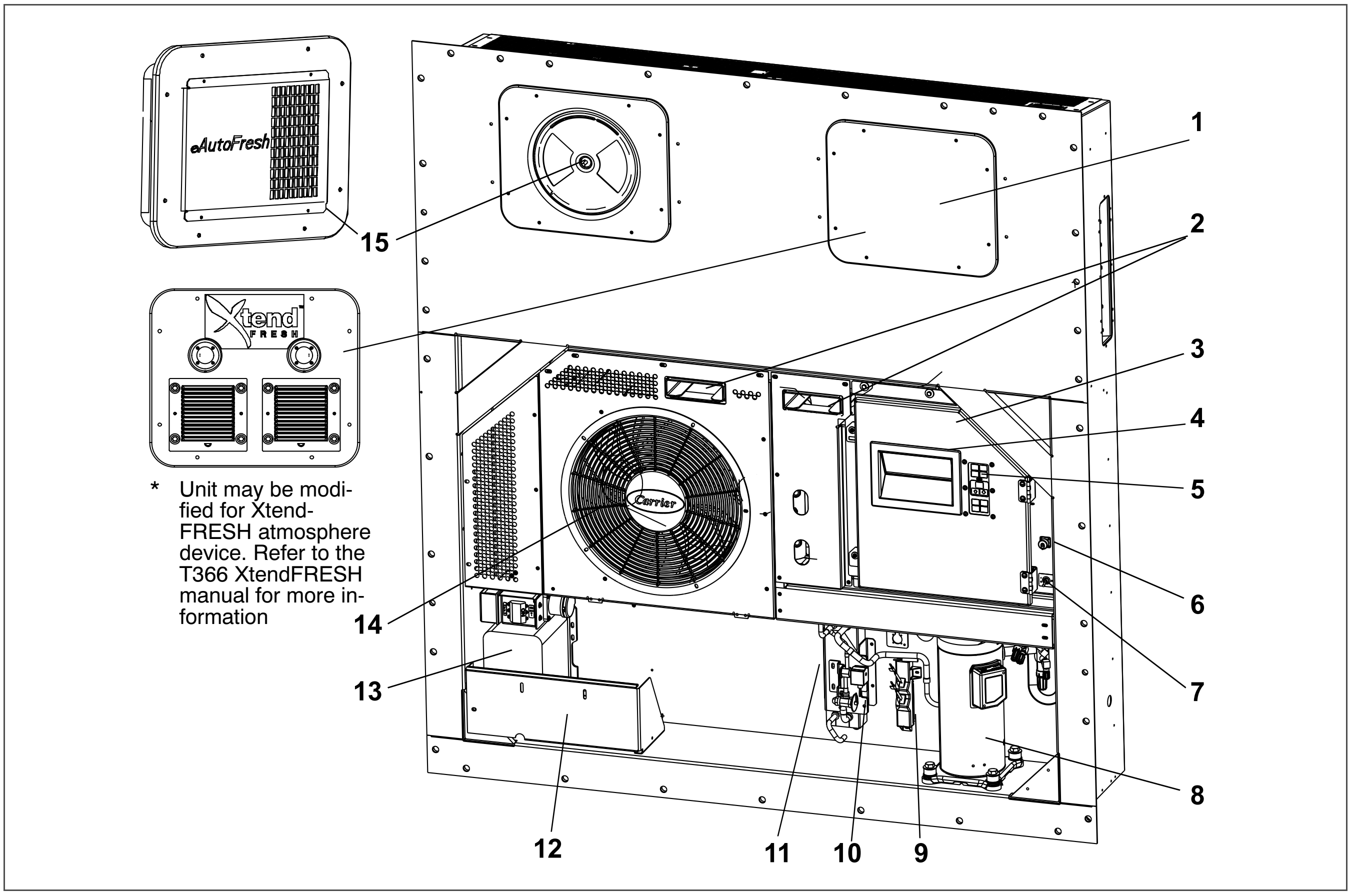
The unit is designed so that the majority of the components are accessible from the front (see **Figure 3.1**). The unit model number, serial number and parts identification number can be found on the serial plate on the back wall of the condenser section.

3.1.2 Fresh Air Makeup Vent

The function of the upper or lower makeup air vent is to provide ventilation for commodities that require fresh air circulation. A manually operated venting system is located in the upper left access panel.

The optional eAutoFresh vent system is used to moderate the atmospheric level in the container in response to cargo respiration. When transporting frozen cargo loads the vent will be closed. The upper left access panel contains the vent slide and motor assembly. It may be removed to allow entry into the evaporator section where the CO_2 sensor and drive pack are located.

Figure 3.1 Refrigeration Unit - Front Section



* Unit may be modified for XtendFRESH atmosphere device. Refer to the T366 XtendFRESH manual for more information

1. Access Panel (Evap. Fan #1)
2. Fork Lift Pockets
3. Control Box
4. Unit Display
5. Key Pad
6. Remote Monitoring Receptacle
7. Start-Stop Switch, ST
8. Compressor
9. Supply Temperature Supply/Recorder Sensor Assembly (STS/SRS)
10. Economizer
11. Ambient Temperature Sensor (AMBS)
12. Power Cables and Plug (Location)
13. Autotransformer
14. Condenser Grille
15. Upper Fresh Air Makeup Vent Panel (Evap. Fan #2)

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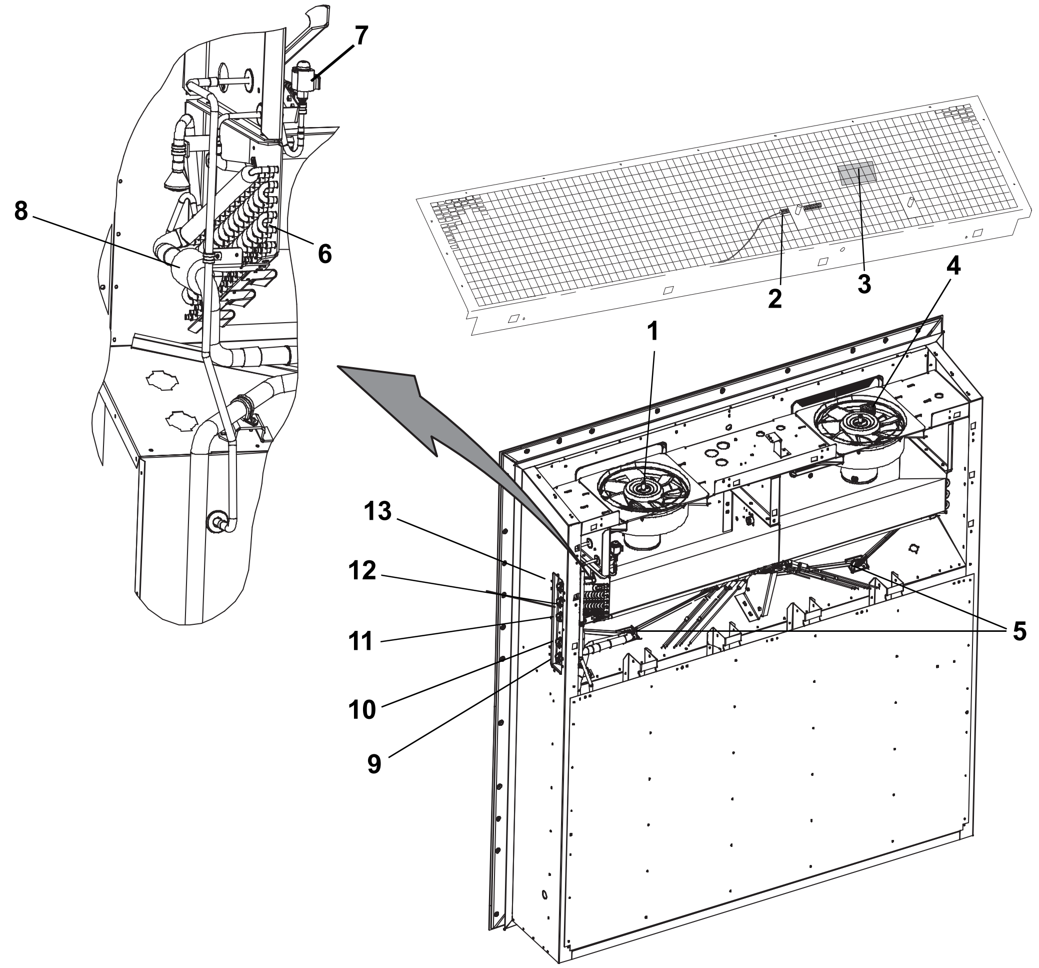
3.1.3 Evaporator Section

The evaporator section is shown below. The evaporator fans circulate air through the container by pulling it in the top of the unit, directing it through the evaporator coil where it is heated or cooled, and discharging it at the bottom.

If the unit is provisioned for XtendFRESH or equipped with eAutoFresh, system components are mounted in addition to the standard refrigeration unit components. The stepper motor component is installed in the vent; the air filter, CO_2 sensor, stepper motor drive and CO_2 sensing lines are installed on the rib of the upper grill.

Most evaporator components are accessible by removing the upper rear panel (as shown in the illustration) or by removing the evaporator fan access panels (see **Figure 3.2**).

Figure 3.2 Evaporator Section



1. Evaporator Fan Motor #1 (EM1)
2. Return Recorder Sensor / Temperature Sensor (RRS/RTS)
3. Humidity Sensor (HS)
4. Evaporator Fan Motor #2 (EM2)
5. Evaporator Coil Heaters (Underside of Coil)
6. Evaporator Coil
7. Electronic Expansion Valve (EEV)
8. Evaporator Temperature Sensors (Location) (ETS1 & ETS2)
9. Interrogator Connector (Rear) (ICR)
10. USDA Probe Receptacle PR2
11. USDA Probe Receptacle PR1
12. USDA Probe Receptacle PR3
13. Cargo Probe Receptacle PR4

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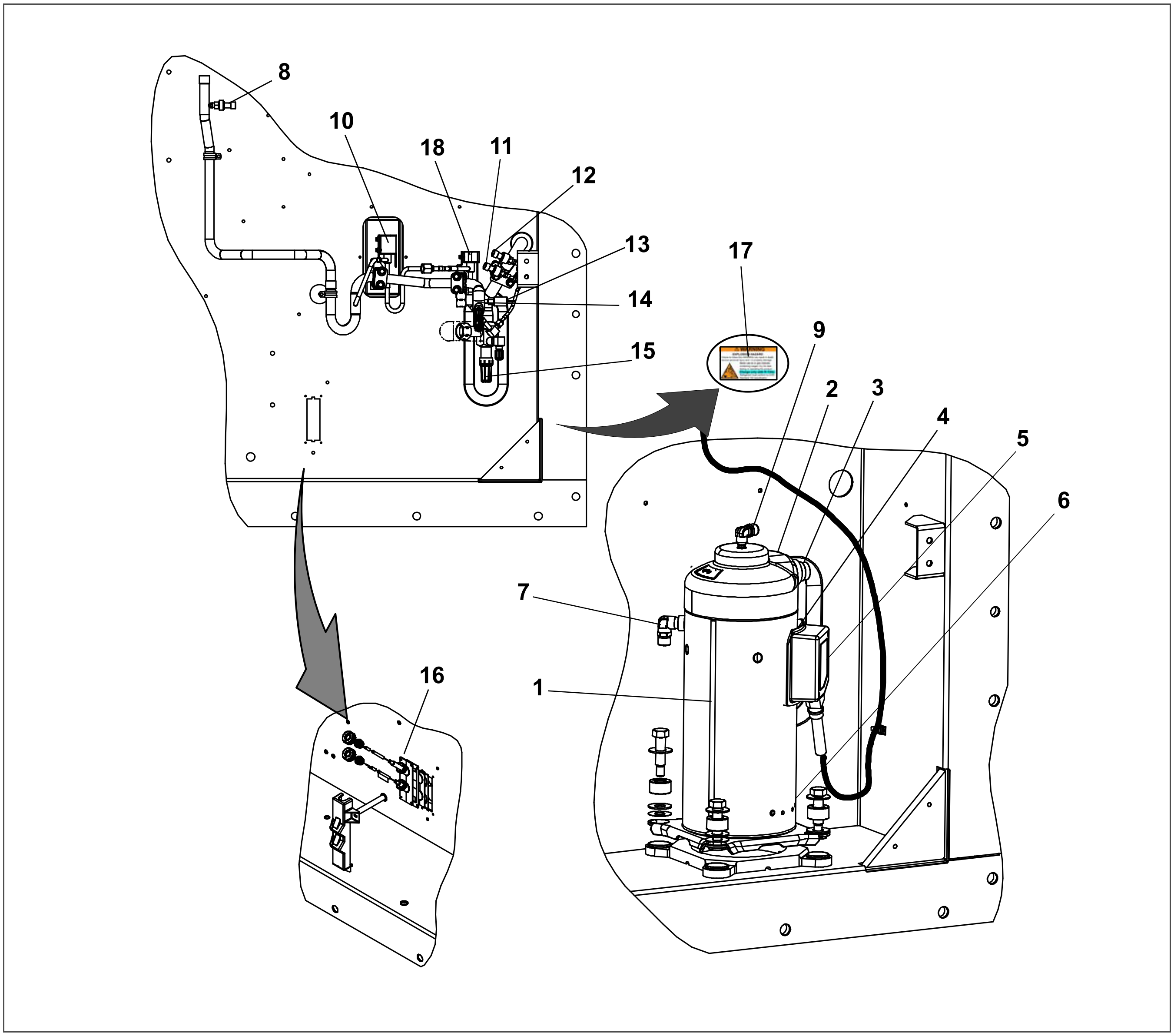
3.1.4 Compressor Section

The compressor section includes the compressor, digital loader valve (DLV), digital unloader valve (DUV), high pressure switch (HPS), discharge pressure transducer (DPT), evaporator pressure transducer (EPT) and the suction pressure transducer (SPT).

The supply temperature sensor and supply recorder sensor are located to the left of the compressor.

Figure 3.3 Compressor Section



1. Compressor	10. Digital Loader Valve (DLV)
2. Compressor Discharge Temperature Sensor (CPDS) (Location)	11. Suction Pressure Transducer (SPT)
3. Discharge Connection	12. Evaporator Pressure Transducer (EPT)
4. Suction Connection (Location)	13. High Pressure Switch (HPS)
5. Compressor Terminal Box	14. Discharge Service Valve
6. Oil Drain (Location)	15. Suction Service Valve
7. Economizer Connection	16. Supply Temperature/Supply Recorder Sensor Assembly (STS/SRS)
8. Discharge Pressure Transducer (DPT)	17. Warning Label
9. DUV/DLV Connection	18. Digital Unloader Valve (DUV)

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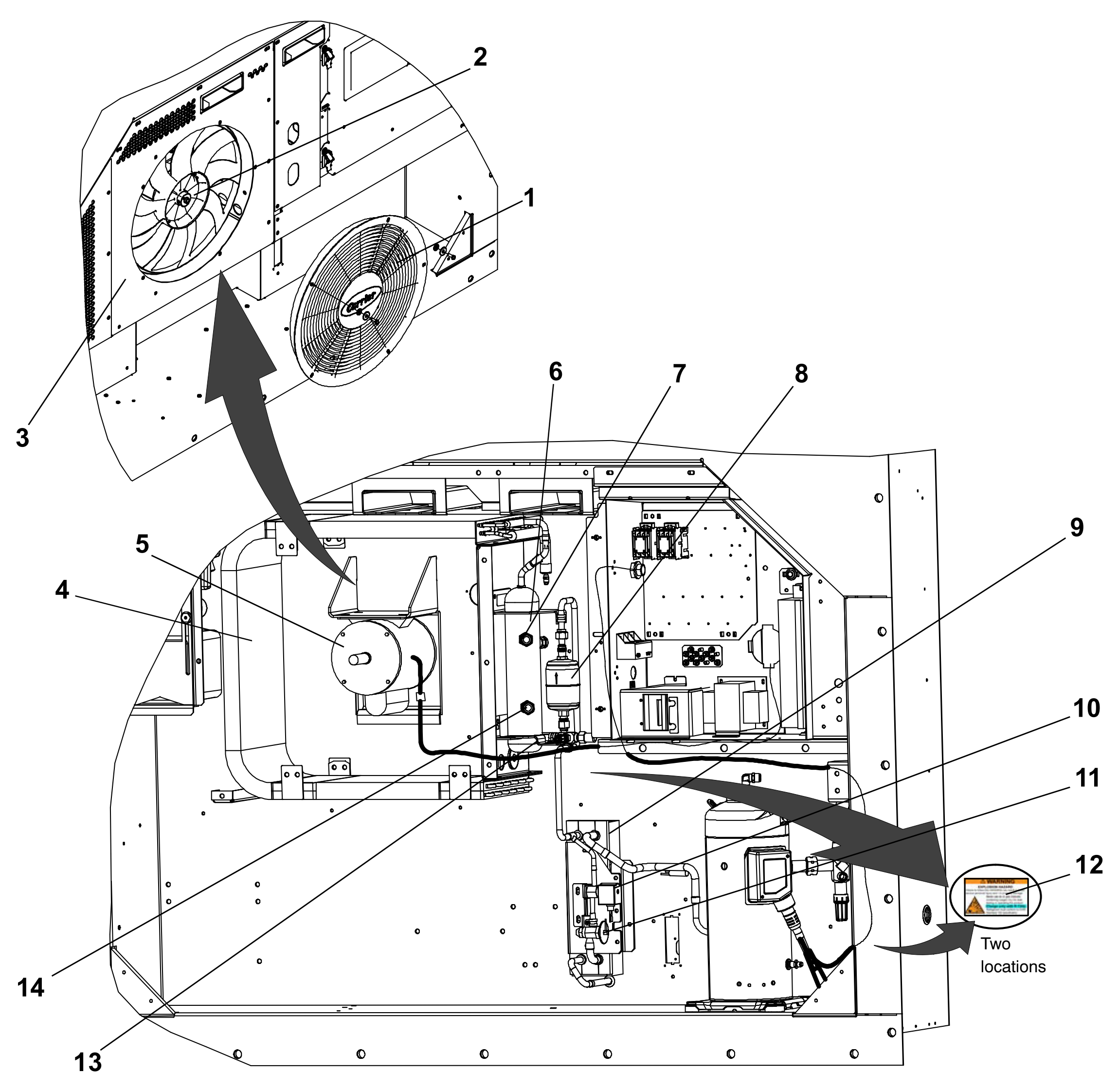
3.1.5 Air-Cooled Condenser Section

The air-cooled condenser section consists of the condenser fan, condenser coil, receiver, liquid line service valve, filter drier, fusible plug, economizer, economizer expansion valve, economizer solenoid valve (ESV), and sight glass/moisture indicator.

The condenser fan pulls air from around the coil and discharges it horizontally through the condenser fan grille.

Figure 3.4 Air-Cooled Condenser Section



1. Grille and Venturi Assembly
2. Condenser Fan
3. Condenser Coil Cover
4. Condenser Coil
5. Condenser Fan Motor
6. Receiver
7. Sight Glass
8. Filter Drier
9. Economizer
10. Economizer Solenoid Valve (ESV)
11. Economizer Expansion Valve
12. Warning Label (location)
13. Service Access Valve
14. Liquid Level/Moisture Indicator

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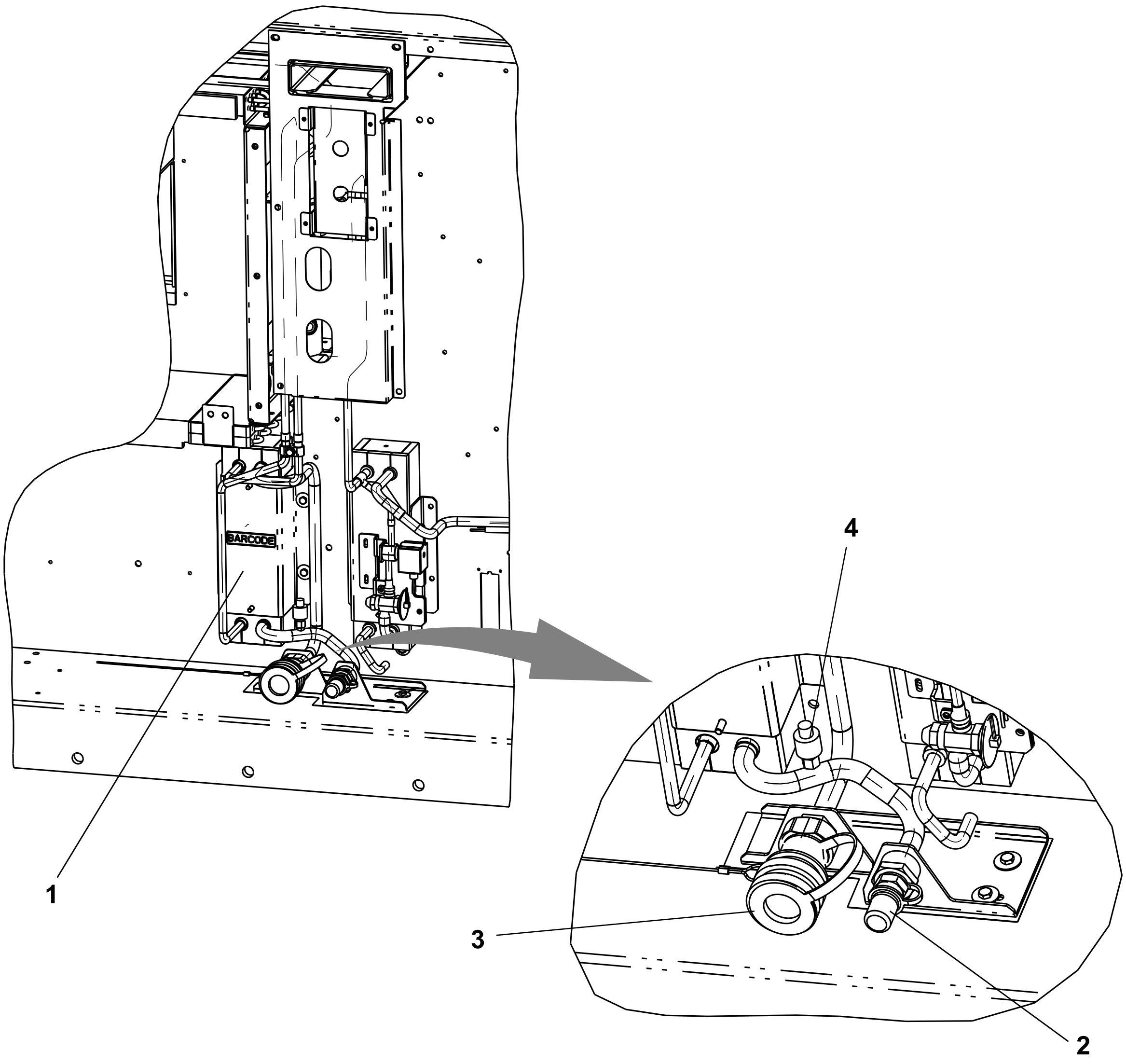
3.1.6 Water-Cooled Condenser Section

The unit may contain a water-cooled condenser (WCC) installed as an option. When operating on the water-cooled condenser, the condenser fan is deactivated by a water pressure switch or condenser fan switch.

The brazed plate water-cooled condenser section (Figure 3.5) consists of the brazed plate water-cooled condenser (WCC), water couplings, a water pressure switch and a fusible plug. The receiver is retained in this configuration and the brazed plate heat exchanger is placed between the air-cooled condenser and the receiver.

Figure 3.5 Brazed-Plate Water-Cooled Condenser



1. Water-Cooled Condenser (WCC)
2. Coupling - Water In
3. Self Draining Coupling - Water Out
4. Water Pressure Switch (WPS)

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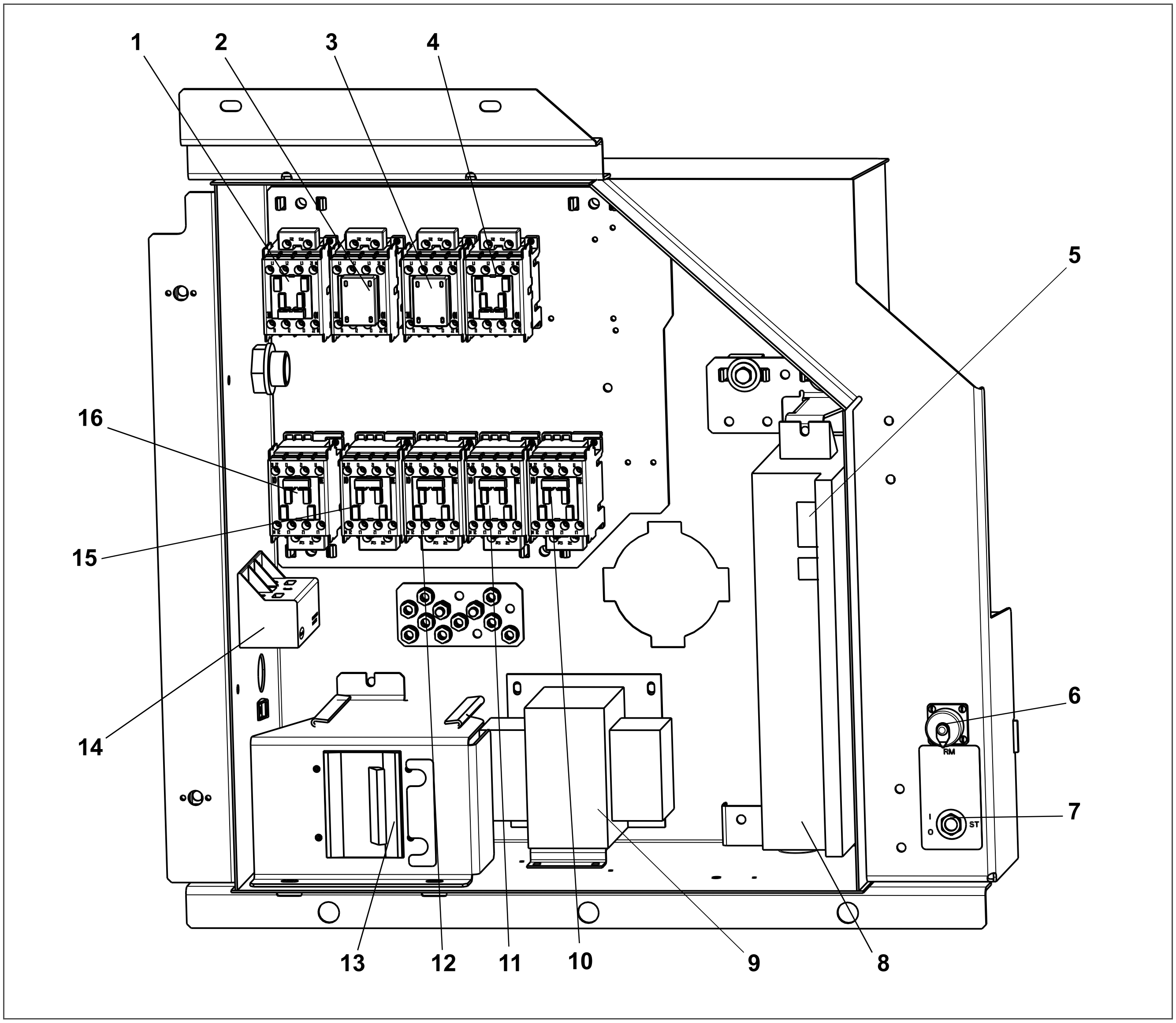
3.1.7 Control Box Section

The control box (Figure 3.6) includes: the manual operation switches, circuit breaker (CB-1), compressor, fan and heater contactors, control power transformer, fuses, key pad, display module, current sensor module, controller module and the communications interface module.

3.1.8 Communications Interface Module

The communications interface module is a slave module which allows communication between the refrigeration unit and a ship system master central monitoring station. The module will respond to communication and return information over the ships main power line. Refer to the master system technical manual for further information.

Figure 3.6 Control Box Section



1. Compressor Contactor - CH
2. Compressor Phase A Contactor - PA
3. Compressor Phase B Contactor - PB
4. Heater Contactor - HR
5. Controller/DataCORDER Module (Controller)
6. Remote Monitoring Receptacle
7. Start-Stop Switch, ST
8. Controller Battery Pack (Standard Location)
9. Control Transformer
10. High Speed Evaporator Fan Contactor - EF
11. Low Speed Evaporator Fan Contactor - ES
12. Condenser Fan Contactor - CF
13. Circuit Breaker - 460V
14. Current Sensor Module
15. Condenser Fan Low Speed - LC
16. Condenser Fan (High Speed Shorting) - FS

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3.2 Refrigeration System Data

Table 3–1 Refrigeration System Data

Compressor / Motor Assembly	Model Number	ZMD26K2E-TFD-274
	Weight (With Oil)	42.9 kg (95 lb)
	Approved Oil	Uniqema Emkarate RL-32-3MAF
	Oil Charge	1774 ml (60 ounces)
Electronic Expansion Valve Superheat (Evaporator)	Verify at -18°C (0°F) container box temperature	4.4 to 6.7°C (8 to 12°F)
High Pressure Expansion Valve (HPXV)	Verify at -18°C (0°F) container box temperature	4.4 to 11.1°C (8 to 20°F)
Heater Termination Thermostat (HTT)	Opens	54° (+/- 3) C = 130° (+/- 5) F
	Closes	38° (+/- 4) C = 100° (+/- 7) F
High Pressure Switch (HPS)	Cut-Out	(+/- 1.0) kg/cm^2 = 350 (+/- 10) psig
	Cut-In	(+/- 0.7) kg/cm^2 = 250 (+/- 10) psig

⚠ WARNING

EXPLOSION HAZARD: Failure to follow this WARNING can result in death, serious personal injury and / or property damage.

Never use air or gas mixtures containing oxygen (O_2) for leak testing or operating the product.

Charge Only With R-134a: Refrigerant must conform to AHRI Standard 700 specification.

Refrigerant	R-134a	Conforming to AHRI standard 700 specifications.

⚠ CAUTION

Charge water-cooled condenser or receiver according to nameplate specifications to ensure optimal unit performance.

Refrigerant Charge	Receiver	4.54kg (10 lbs)
Fusible Plug	Melting Point	99°C = (210°F)
	Torque	6.2 to 6.9 mkg (45 to 50 ft-lbs)
Rupture Disc	Bursts at	35 +/- 5% kg/cm^2 = (500 +/- 5% psig)
	Torque	6.2 to 6.9 mkg (45 to 50 ft-lbs)
Unit Weight	Refer to unit model number plate.	
Water Pressure Switch	Cut-In	0.5 +/- 0.2 kg/cm^2 (7 +/- 3 psig)
	Cutout	1.6 +/- 0.4 kg/cm^2 (22 +/- 5 psig)

3.3 Electrical System Data

Circuit Breaker	CB-1 (25 amp)	Trips at 29 amps
	CB-2 (50 amp)	Trips at 62.5 amps
	CB-3 (70 amp)	Trips at 87.5 amps

Compressor Motor	Full Load Amps (FLA)	13 amps @ 460 VAC	
Condenser Fan Motor		**380 VAC/3 PH/50 Hz**	**460 VAC/3 PH/60 Hz**
	Full Load Amps, High Speed	0.73	0.80
	Full Load Amps, Low Speed	.42	.44
	RPM, High Speed	1425 rpm	1725 rpm
	RPM, Low Speed	720 rpm	850 rpm
	Voltage and Frequency	360 - 460 VAC +/-2.5Hz	400 - 506 VAC +/-2.5Hz
	Bearing Lubrication	Factory lubricated, additional grease not required.	
	Rotation	CW when viewed from shaft end.	
Evaporator Coil Heaters	Number of Heaters	6	
	Rating	750 watts +5/-10% each @ 230 VAC	
	Resistance (cold)	6.8 to 77.2 ohms @ 20°C (68°F)	
	Type	Sheath	
Evaporator Fan Motors		**380 VAC/3 PH/50 Hz**	**460 VAC/3 PH/60 Hz**
	Full Load Amps High Speed	1.07	0.9
	Full Load Amps Low Speed	0.47	0.47
	Rotations Per Minute High Speed	2850 rpm	3450 rpm
	Rotations Per Minute Low Speed	1425 rpm	1725 rpm
	Voltage and Frequency	360 - 460 VAC +/- 1.25Hz	400 - 500 VAC +/- 1.5Hz
	Bearing Lubrication	Factory lubricated, additional grease not required	
	Rotation	CW when viewed from shaft end	
Fuses	Control Circuit	7.5 amps (F3A,F3B)	
	Controller/DataCORDER	5 amps (F1 & F2)	
	Emergency Bypass	10 amps (FEB)	
Vent Position Sensor (VPS)	Electrical Output	0.5 VDC to 4.5 VDC over 90 degree range	
	Supply Voltage	5 VDC +/- 10%	
	Supply Current	5 mA (typical)	
Solenoid Valve Coils (ESV/ USV) 24 VAC	Nominal Resistance @ 77°F (25°C)	7.7 ohms +/- 5%	
	Maximum Current Draw	0.7 amps	
DLV Coil 12 VDC	Nominal Resistance @ 68°F (20°C)	14.8 ohms +/- 5%	
DUV Coil 24VAC	Nominal Resistance @ 68°F (20°C)	15.5 ohms +/- 5%	
EEV Nominal Resistance	Coil Feed to Ground (Gray Wire)	47 ohms	
	Coil Feed to Coil Feed	95 ohms	

Humidity Sensor	Orange wire	Power
	Red wire	Output
	Brown wire	Ground
	Input voltage	5 VDC
	Output voltage	0 to 3.3 VDC
	Output voltage readings verses relative humidity (RH) percentage:	
	30%	0.99 V
	50%	1.65 V
	70%	2.31 V
	90%	2.97 V
Controller	Setpoint Range	-35 to +30°C (-31 to +86°F)

3.4 Safety and Protective Devices

Unit components are protected from damage by safety and protective devices listed in **Table 3–1**. These devices monitor the unit operating conditions and open a set of electrical contacts when an unsafe condition occurs.

Open safety switch contacts on either or both of devices IP-CP or HPS will shut down the compressor.

Open safety switch contacts on device IP-CM will shut down the condenser fan motor.

The entire refrigeration unit will shut down if one of the following safety devices open: (a) circuit breaker(s); (b) fuse (F3A/F3B, 7.5A); or (c) evaporator fan motor internal protector(s) - (IP).

Table 3–2 Safety and Protective Devices

Unsafe Condition	Device	Device Setting
Excessive current draw	Circuit Breaker (CB-1, 25 amp) - Manual Reset	Trips at 29 amps (460 VAC)
	Circuit Breaker (CB-2, 50 amp) - Manual Reset	Trips at 62.5 amps (230 VAC)
	Circuit Breaker (CB-2, 70 amp) - Manual Reset	Trips at 87.5 amps (230 VAC)
Excessive current draw in the control circuit	Fuse (F3A & F3B)	7.5 amp rating
Excessive current draw by the controller Fuse	Fuse (F1 & F2)	5 amp rating
Excessive current draw by the Emergency Bypass module	Fuse (FEB)	10 amp rating
Excessive condenser fan motor winding temperature	Internal Protector (IP-CM) - Automatic Reset	N/A
Excessive compressor motor winding temperature	Internal Protector (IP-CP) - Automatic Reset	N/A
Excessive evaporator fan motor(s) winding temperature	Internal Protector(s) (IP-EM) - Automatic Reset	N/A
Abnormal pressures/temperatures in the high refrigerant side	Fusible Plug - Used on the Receiver	99°C = (210°F)
	Rupture Disc - Used on the Water-Cooled Condenser	35 kg/cm^2 = (500 psig)
Abnormally high discharge pressure	High Pressure Switch (HPS)	Opens at 25 kg/cm^2 (350 psig)

3.5 Refrigeration Circuit

3.5.1 Standard Operation

Starting at the compressor, (see **Figure 3.7**, upper schematic) the suction gas is compressed to a higher pressure and temperature.

The refrigerant gas flows through the discharge line and continues into the air-cooled condenser. When operating with the air-cooled condenser active, air flowing across the coil fins and tubes cools the gas to saturation temperature. By removing latent heat, the gas condenses to a high pressure/high temperature liquid and flows to the receiver, which stores the additional charge necessary for low temperature operation.

The liquid refrigerant continues through the liquid line, the filter drier (which keeps refrigerant clean and dry) and the economizer (not active during standard operation) to the electronic expansion valve (EEV).

As the liquid refrigerant passes through the variable orifice of the EEV, the pressure drops to suction pressure. In this process some of the liquid vaporizes to a gas (flash gas), removing heat from the remaining liquid. The liquid exits as a low pressure, low temperature, saturated mix. Heat is then absorbed from the return air by the balance of the liquid, causing it to vaporize in the evaporator coil. The vapor then flows through the suction tube back to the compressor.

During the standard mode of operation, the normally closed valves, digital loader valve (DLV) and digital unloader valve (DUV), control the system refrigerant flow and capacity by loading and unloading the compressor in frequent discrete time intervals. The DLV and DUV operate in opposition to each other such that when the DLV is closed the DUV is open and vice versa. The valves cycle on a fixed duty cycle so that maximum capacity occurs when the DLV is open 100% of the time and the DUV is open 0% and minimum capacity is when the DLV is open 0% of the time and the DUV 100% of the time. If the system capacity has been decreased to the lowest allowable capacity, the unit will enter a trim heat mode of operation, during which the controller will pulse the evaporator heaters in sequence with the compressor digital signal in order to absorb the excess capacity.

3.5.2 Economized Operation

In the economized mode, (see **Figure 3.8**) the frozen and pull down capacity of the unit is increased by sub-cooling the liquid refrigerant entering the electronic expansion valve. Overall efficiency is increased because the gas leaving the economizer enters the compressor at a higher pressure, therefore requiring less energy to compress it to the required condensing conditions.

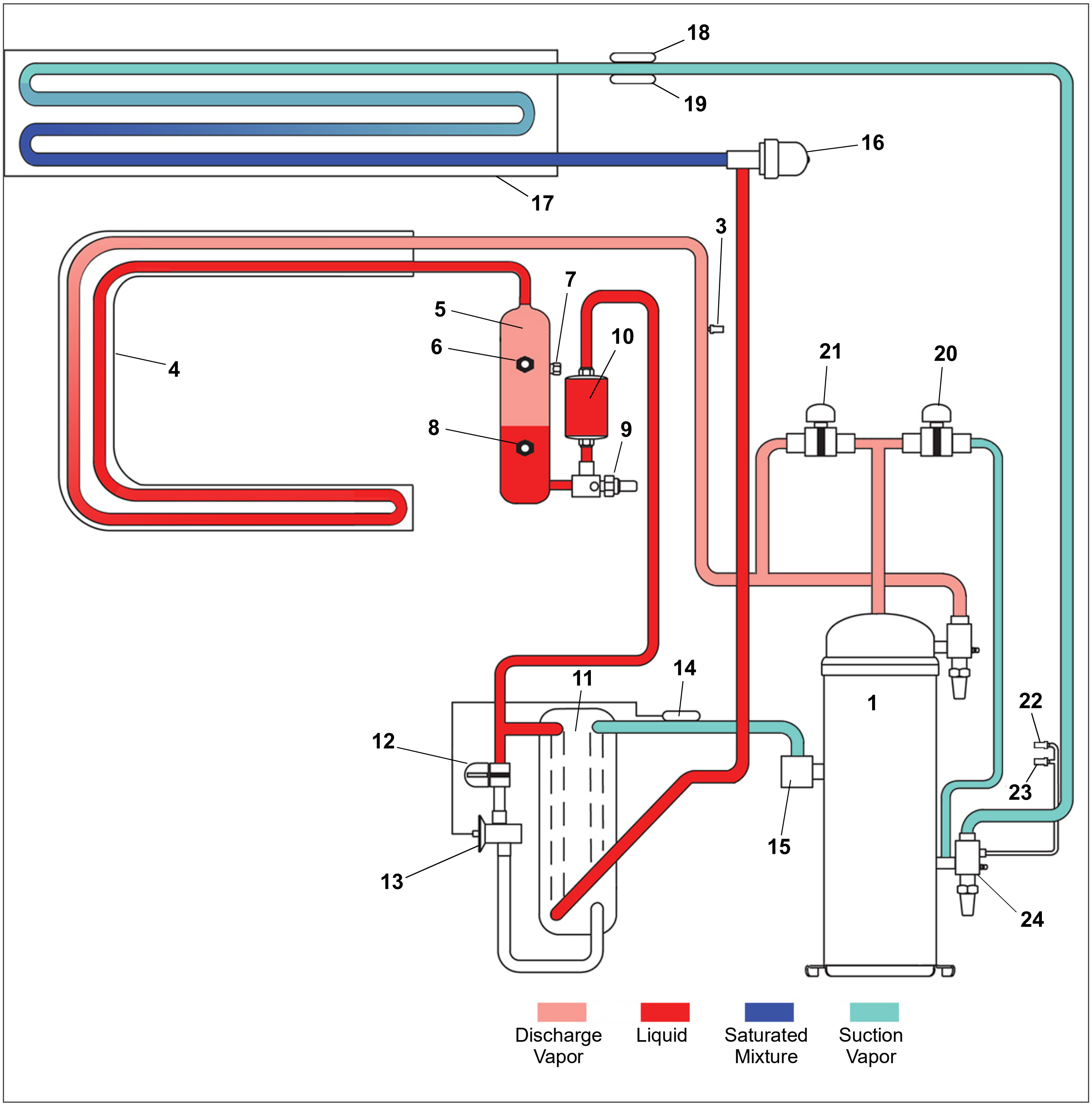
Liquid refrigerant for use in the economizer circuit is taken from the main liquid line as it leaves the filter drier. The flow is activated when the controller energizes the economizer solenoid valve (ESV).

The liquid refrigerant flows through the ESV to the economizer expansion valve internal passages, absorbing heat from the liquid refrigerant flowing to the electronic expansion valve. The resultant “medium” temperature/pressure gas enters the compressor at the economizer port fitting.

3.5.3 Economizer Expansion Valve

The microprocessor controls the superheat leaving the economizer expansion valve (EXV). From the EXV the refrigerant flows through the internal passages of the economizer heat exchanger, absorbing heat from the refrigerant flowing to the EEV. The resultant “medium” temperature/pressure gas enters the compressor at the economizer port fitting.

Figure 3.7 Refrigeration Circuit Schematic - Standard Operation



1. Compressor
2. Discharge Service Valve
3. Discharge Pressure Transducer (DPT)
4. Condenser
5. Receiver
6. Receiver Sight Glass
7. Fusible Plug
8. Receiver Liquid Level / Moisture Indicator
9. Liquid Line Service Valve
10. Filter Drier
11. Economizer
12. Economizer Solenoid Valve (ESV)
13. Economizer Expansion Valve (EXV)
14. Economizer Expansion Valve (EXV) Sensing Bulb
15. Economizer Connection
16. Electronic Expansion Valve (EEV)
17. Evaporator
18. Evaporator Temperature Sensor (ETS1)
19. Evaporator Temperature Sensor (ETS2)
20. Digital Unloader Valve (DUV)
21. Digital Loader Valve (DLV)
22. Evaporator Pressure Transducer (EPT)
23. Suction Pressure Transducer (SPT
24. Suction Service Valve

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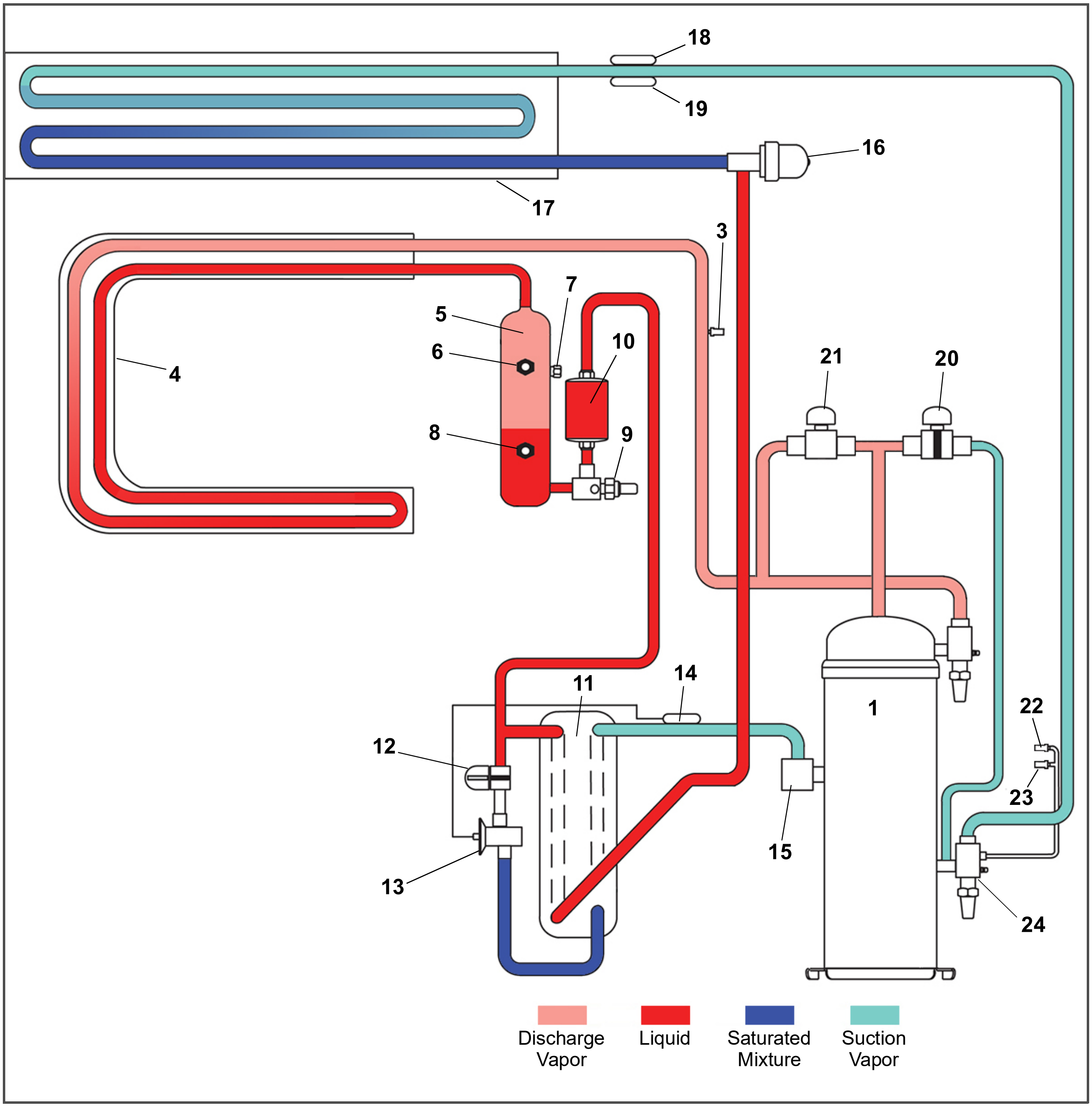
Figure 3.8 Refrigeration Circuit Schematic - Economized Operation



1. Compressor
2. Discharge Service Valve
3. Discharge Pressure Transducer (DPT)
4. Condenser
5. Receiver
6. Receiver Sight Glass
7. Fusible Plug
8. Receiver Liquid Level / Moisture Indicator
9. Liquid Line Service Valve
10. Filter Drier
11. Economizer
12. Economizer Solenoid Valve (ESV)
13. Economizer Expansion Valve (EXV)
14. Economizer Expansion Valve (EXV) Sensing Bulb
15. Economizer Connection
16. Electronic Expansion Valve (EEV)
17. Evaporator
18. Evaporator Temperature Sensor (ETS1)
19. Evaporator Temperature Sensor (ETS2)
20. Digital Unloader Valve (DUV)
21. Digital Loader Valve (DLV)
22. Evaporator Pressure Transducer (EPT)
23. Suction Pressure Transducer (SPT
24. Suction Service Valve

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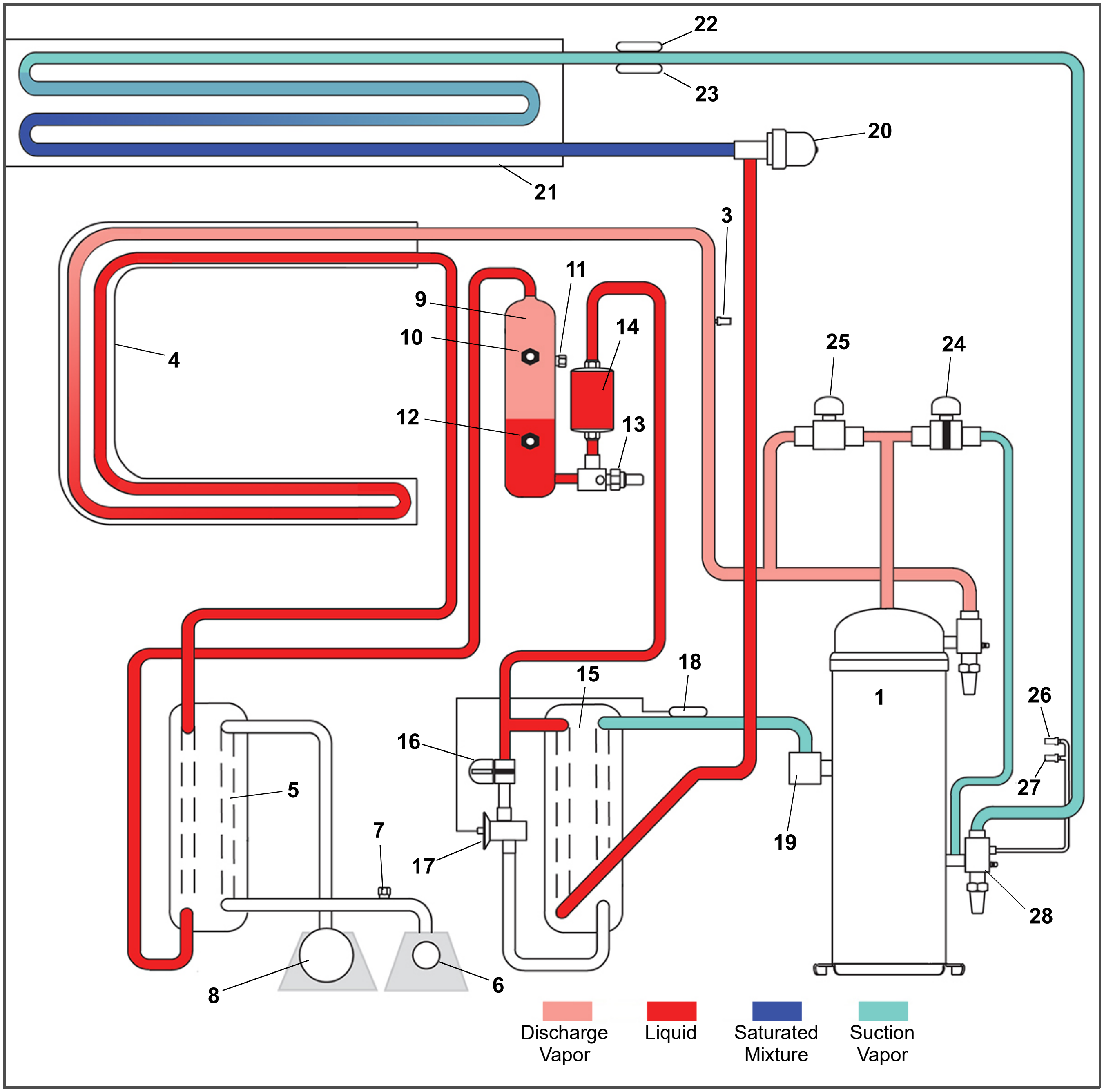
Figure 3.9 Refrigeration Circuit Schematic - Water-Cooled Condenser



1. Compressor
2. Discharge Service Valve
3. Discharge Pressure Transducer (DPT)
4. Condenser
5. Water-Cooled Condenser
6. Coupling (Water In)
7. Water Pressure Switch
8. Coupling (Water Out)
9. Receiver
10. Receiver Sight Glass
11. Fusible Plug
12. Receiver Liquid Level / Moisture Indicator
13. Liquid Line Service Valve
14. Filter Drier
15. Economizer
16. Economizer Solenoid Valve (ESV)
17. Economizer Expansion Valve (EXV)
18. Economizer Expansion Valve (EXV) Sensing Bulb
19. Economizer Connection
20. Electronic Expansion Valve (EEV)
21. Evaporator
22. Evaporator Temperature Sensor (ETS1)
23. Evaporator Temperature Sensor (ETS2)
24. Digital Unloader Valve (DUV)
25. Digital Loader Valve (DLV)
26. Evaporator Pressure Transducer (EPT)
27. Suction Pressure Transducer (SPT
28. Suction Service Valve

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SECTION 4

MICROPROCESSOR

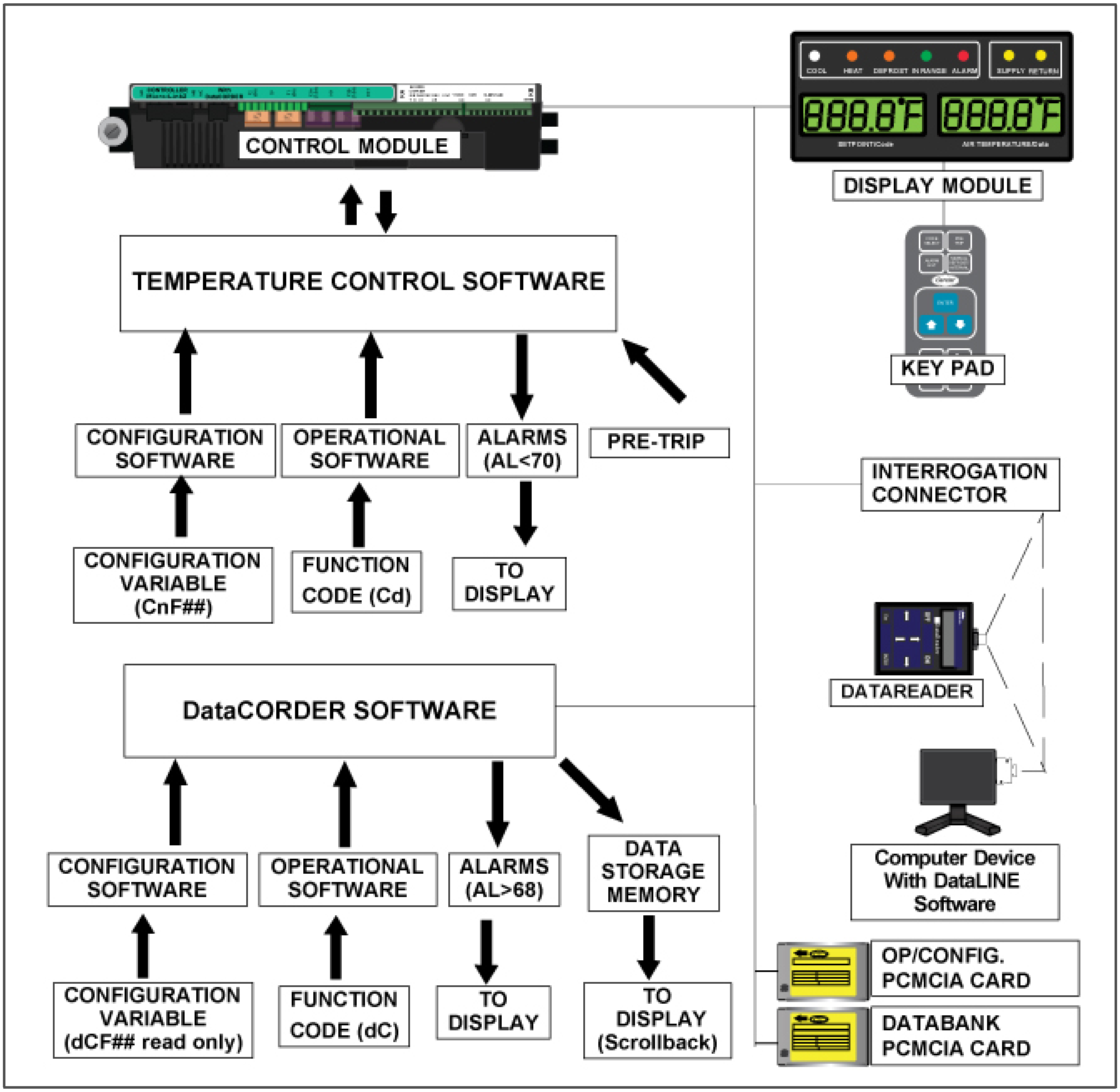
4.1 Temperature Control Microprocessor System

The temperature control Micro-Link 3 microprocessor system (see **Figure 4.1**) consists of a keypad, display module, the control module (controller) and interconnecting wiring. The controller houses the temperature control software and the DataCORDER software. The temperature control software functions to operate the unit components as required to provide the desired cargo temperature and humidity.

The DataCORDER software functions to record unit operating parameters and cargo temperature parameters for future retrieval. Coverage of the temperature control software begins with **Section 4.2**. Coverage of the DataCORDER software is provided in **Section 4.8**.

The keypad and display module serve to provide user access and readouts for both of the controller functions, temperature control and DataCORDER. The functions are accessed by keypad selections and viewed on the display module. The components are designed to permit ease of installation and removal

Figure 4.1 Temperature Control System



4.1.1 Key Pad

The key pad (**Figure 4.2**) is mounted on the control box door. The key pad consists of eleven push button switches that act as the user's interface with the controller. Descriptions of the key pad switch functions are provided in **Table 4–1**.

Figure 4.2 Key Pad

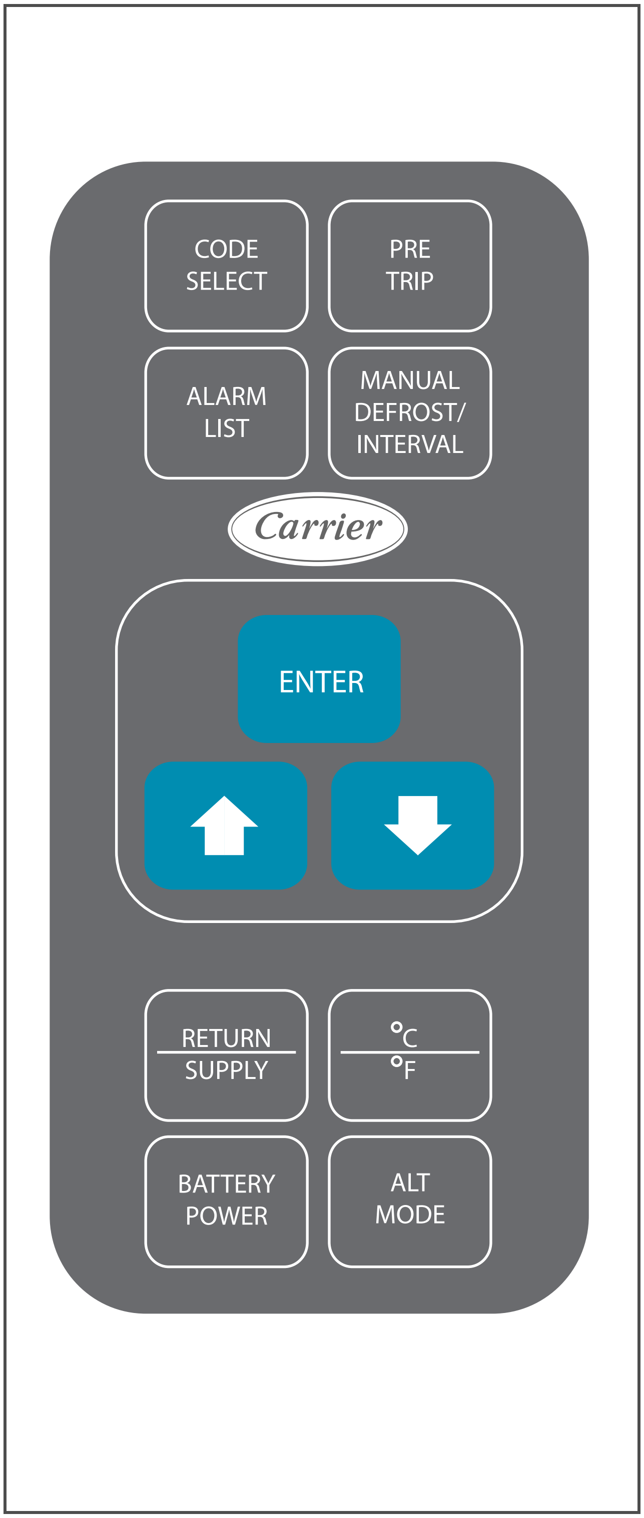


Table 4–1 Key Pad Description

Key	Function
CODE SELECT	Accesses function codes.
PRE-TRIP	Displays Pre-trip selection menu. Discontinues Pre-trip in progress.
ALARM LIST	Displays alarm list and clears the alarm queue.
MANUAL DEFROST / INTERVAL	Displays selected defrost mode. Depressing and holding the Defrost Interval key for five (5) seconds will initiate defrost using the same logic as if the optional manual defrost switch was toggled on.
ENTER	Confirms a selection or saves a selection to the controller.
Arrow Up	Change or scroll a selection upward. Pre-trip advance or test interruption.
Arrow Down	Change or scroll a selection downward. Pre-trip repeat backward.
RETURN / SUPPLY	Displays non-controlling probe temperature (momentary display)
Celsius / Fahrenheit	Displays alternate English/Metric scale (momentary display). When set to F, pressure is displayed in psig and vacuum in "/hg." "P" appears after the value to indicate psig and "i" appears for inches of mercury. When set to C, pressure readings are in bars. "b" appears after the value to indicate bars.
BATTERY POWER	Initiate battery backup mode to allow set point & function code selection if AC power is not connected.
ALT MODE	This key is pressed to switch the functions from the temperature software to the DataCORDER Software. The remaining keys function the same as described above except the readings or changes are made to the DataCORDER programming.

4.1.2 Display Module

The display module (Figure 4.3) consists of two five digit displays and seven indicator lights. The indicator lights include:

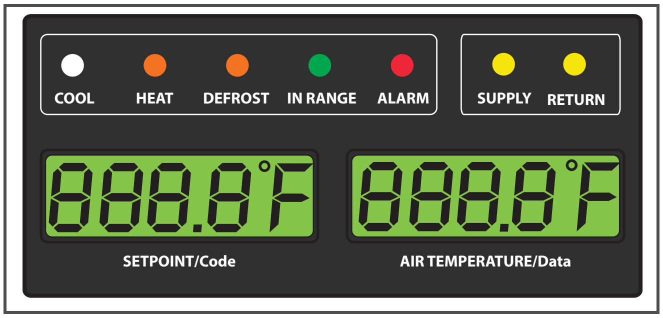
- **COOL** - White or Blue LED: Energized when the refrigerant compressor is energized.
- **HEAT** - Orange LED: Energized to indicate heater operation in heat mode, defrost mode, or dehumidification.
- **DEFROST** - Orange LED: Energized when the unit is in defrost mode.
- **IN RANGE** - Green LED: Energized when the controlled temperature probe is within specified tolerance of set point.

NOTICE

The controlling probe in perishable range will be the SUPPLY air probe and the controlling probe in frozen range will be the RETURN air probe.

- **ALARM** - Red LED: Energized when there is an active or an inactive shutdown alarm in the alarm queue.
- **SUPPLY** - Yellow LED: Energized when the supply air probe is used for control. When this LED is illuminated, the temperature displayed in the AIR TEMPERATURE display is the reading at the supply air probe. This LED will flash if dehumidification is enabled.
- **RETURN** - Yellow LED: Energized when the return air probe is used for control. When this LED is illuminated, the temperature displayed in the AIR TEMPERATURE display is the reading at the return air probe. This LED will flash if dehumidification is enabled.

Figure 4.3 Display Module



4.1.3 Controller

⚠ CAUTION

Do not remove wire harnesses from circuit boards unless you are grounded to the unit frame with a static safe wrist strap or equivalent static drain device.

⚠ CAUTION

Remove the controller module and unplug all connectors before performing any arc welding on any part of the container.

⚠ CAUTION

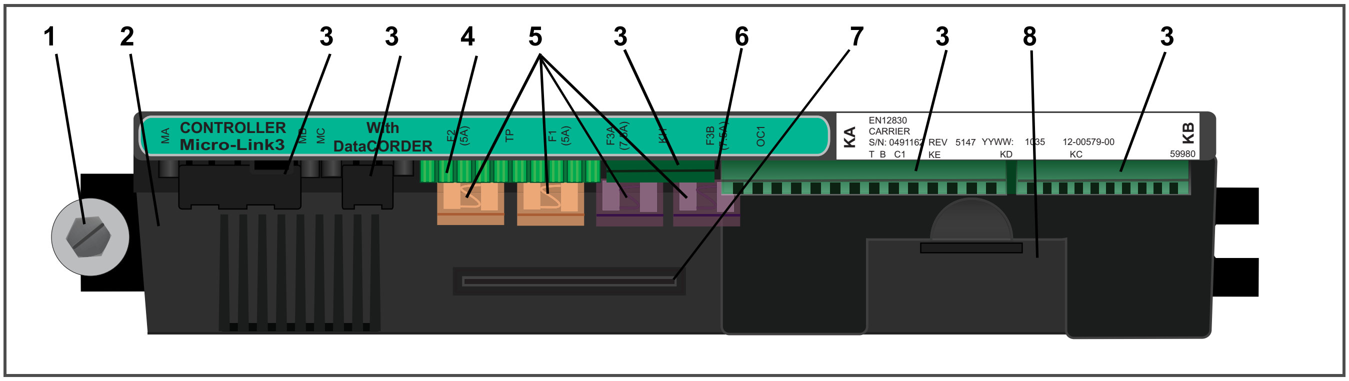
Do not attempt to use an ML2i PC card in an ML3 equipped unit. The PC cards are physically different and will result in damage to the controller.

NOTICE

Do not attempt to service the controller modules. Breaking the seal will void the warranty.

The Micro-Link 3 controller is a dual module microprocessor as shown in **Figure 4.4**. It is fitted with test points, harness connectors and a software card programming port.

Figure 4.4 Control Module



1. Mounting Screw
2. Micro-Link 3 Control/DataCORDER Module
3. Connectors
4. Test Points
5. Fuses
6. Control Circuit Power Connection
7. Software Programming Port
8. Battery Pack (Standard Location)

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4.2 Controller Software

The controller software is a custom designed program that is subdivided into configuration software and operational software. The controller software performs the following functions:

- Control supply or return air temperature to required limits, provide modulated refrigeration operation, economized operation, unloaded operation, electric heat control and defrost. Defrost is performed to clear buildup of frost and ice in order to ensure proper air flow across the evaporator coil.
- Provide default independent readouts of set point and supply or return air temperatures.
- Provide ability to read and (if applicable) modify the configuration software variables, operating software Function Codes and Alarm Code indications.
- Provide a Pre-trip step-by-step checkout of refrigeration unit performance including: proper component operation, electronic and refrigeration control operation, heater operation, probe calibration, pressure limiting and current limiting settings.
- Provide battery-powered ability to access or change selected codes and set point without AC power connected.
- Provide the ability to reprogram the software through the use of a memory card.

4.2.1 Configuration Software (CnF Variables)

Configuration software is a variable listing of the components available for use by the operational software. This software is factory installed in accordance with the equipment fitted and options listed on the original purchase order. Changes to the configuration software are required only when a new controller has been installed or a physical change has been made to the unit such as the addition or removal of an option. A configuration variable list is provided in **Table 4–2**. Change to the factory-installed configuration software is achieved via a configuration card or by communications.

4.2.2 Operational Software (Cd Function Codes)

The operational software is the actual operation programming of the controller which activates or deactivates components in accordance with current unit operating conditions and operator selected modes of operation.

The programming is divided into function codes. Some of the codes are read only while the remaining codes may be user configured. The value of the user configurable codes can be assigned in accordance with user desired mode of operation. A list of the function codes is provided in **Table 4–3**.

To access the function codes, perform the following:

1. Press the CODE SELECT key, then press an arrow key until the left window displays the desired code number.
2. The right window will display the selected function code value for five seconds before returning to normal display mode.
3. If additional time is required, pressing the ENTER key will extend the display time to 30 seconds.

4.3 Controller Sequence and Modes of Operation

General operation sequences for cooling, heating and defrost are provided in the following sub-paragraphs. Schematic representation of controller operation is provided in **Figure 4.5** and **Figure 4.8**.

Operational software responds to various inputs. These inputs come from the temperature sensors and pressure transducers, the temperature set point, the settings of the configuration variables and the function code assignments. The action taken by the operational software changes as the input values change. Overall interaction of the inputs is described as a “mode” of operation. The modes of operation include perishable (chill) mode and frozen mode. Descriptions of the controller interaction and modes of operation are provided in the following sub paragraphs.

4.3.1 Start Up - Compressor Phase Sequence

At start up, the controller logic checks for proper phase sequencing and compressor rotation. If incorrect sequencing is causing the compressor and three-phase evaporator and condenser fan motors to rotate in the wrong direction, the controller will energize or de-energize relay TCP as required (see **Figure 8.2**). Relay TCP will switch its contacts, energizing or de-energizing relays PA and PB. Relay PA is wired to energize the circuits on L1, L2 and L3. Relay PB is wired to energize the circuits on L3, L2, and L1, thus providing reverse rotation.

4.3.2 Start Up - Compressor Bump Start

At start up, the controller logic will initiate a compressor bump start procedure to clear liquid refrigerant from the compressor. If suction and discharge pressures have equalized, the compressor will perform three compressor bump starts. A compressor bump start may also occur after a defrost cycle has been completed.

During Bump Start, the EEV will close. Relays TS, TG, TN, TE, and TV will be de-energized (opened). The result of this action will close the ESV and shut all fans off. The compressor will start for 1 second, then pause for five seconds. This sequence will be repeated two more times. After the final bump start the unit will pre-position the EEV to the correct starting position, pause and start up.

4.3.3 Perishable Mode Temperature Control

In Perishable Mode, the controller maintains the supply air temperature at set point, the SUPPLY indicator light is illuminated and the default reading on the display window is the supply temperature sensor reading.

When the supply air temperature enters the in-range temperature tolerance (Cd30), the green IN-RANGE light will energize.

When CnF26 (Heat Lockout Temperature) is set to -10°C, perishable mode is active with set points above -10°C (+14°F). When CnF26 is set to -5°C, perishable mode is active with set points above -5°C (+23°F).

4.3.4 Perishable Steady State

Perishable Steady State is used to maintain he control temperature near a set point that is above the heat lockout temperature.

On a properly loaded box, the unit will operate in steady state mode. This results in unloaded operation by cycling the DLV and DUV to limit capacity and maintain steady temperature control.

The unit is capable of maintaining supply to within +/-0.2°C (+/-0.36°F) of set point. Supply air temperature is controlled by positioning of the EEV, cycling of DLV and DUV, cycling of the compressor, and cycling of the heaters.

4.3.5 Perishable Idle, Air Circulation

Perishable Idle Mode is used when it is unnecessary to run the compressor to maintain control temperature. If temperature drops to 0.2°C (0.36°F) above set point, the controller determines that cooling is not required or the controller logic determines suction pressure is at the low pressure limit, the unit will transition to Perishable Idle Mode. During Perishable Idle Mode, the compressor is turned off, but the evaporator fans continue to run to circulate air throughout the container. If temperature rises +0.2°C (+0.36°F) above set point, the unit will transition back to perishable steady state.

4.3.6 Perishable Heating

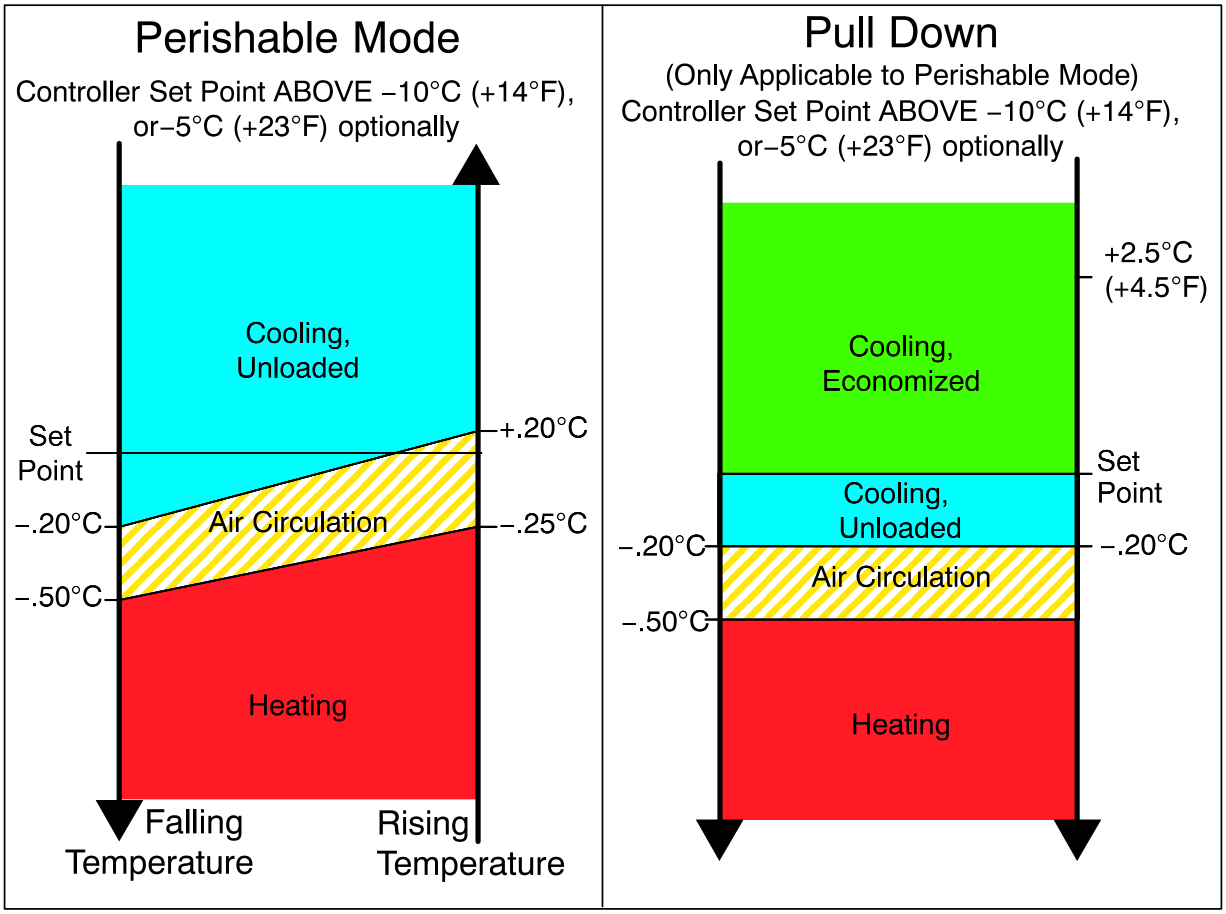
When it is necessary to raise the control temperature, the system will enter Perishable Heating Mode. If the temperature drops to 0.5°C (0.9°F) below set point, the unit will transition to Perishable Heating Mode, and the heaters will be energized. The unit will transition back to Perishable Idle Mode when the temperature rises to 0.2°C (0.36°F) below the set point, and the heaters will de-energize.

4.3.7 Perishable Pulldown

When the system is in Perishable Pulldown Mode, the highest priority is given to bringing the container down to set point. When cooling from a temperature that is more than 2.5°C (4.5°F) above set point, the system will be in perishable pulldown mode in economized operation. However, pressure and current limit functions may restrict the valves if either exceeds the preset value.

Once set point is reached, the unit will transition to perishable steady state mode. This results in unloaded operation by cycling the DLV and DUV to limit capacity and maintain steady temperature control.

Figure 4.5 Controller Operation - Perishable Mode



4.3.8 Perishable Dehumidification

Dehumidification is provided to reduce the humidity levels inside the container, the dehumidification set point range is from 50% to 95%. Dehumidification is activated when a humidity value is set at Cd33. During dehumidification operation the condenser fan speed is fixed in high speed. The yellow SUPPLY LED will flash ON and OFF every second to indicate that dehumidification is active. Once dehumidification is active and the following conditions are satisfied, the controller will activate the heat relay to begin dehumidification.

- The humidity sensor reading is above the humidity set point (Cd33).
- The unit is in perishable steady state and supply air temperature is less than 0.25°C (0.45°F) above set point.
- The heater debounce timer (three minutes) has timed out.
- Heater termination thermostat (HTT) is closed.

If the previously mentioned conditions are true for at least one hour, the evaporator fans will switch from high speed to low speed. Evaporator fan speed will then switch every hour, as long as the 4 conditions are met (see Bulb Mode, **Section 4.3.9** for different evaporator fan speed options).

If any condition except item (1) becomes false OR if the relative humidity sensed is 2% below the dehumidification set point, the high speed evaporator fans will be energized.

During dehumidification power is applied to the defrost heaters. This added heat load causes the controller to open the EEV to match the increased heat load while still holding the supply air temperature very close to the set point.

Opening the EEV reduces the temperature of the evaporator coil surface, which increases the rate at which water is condensed and removes water from the passing air. Removing water from the air reduces the relative humidity. When the relative humidity sensed is 2% below set point, the controller de-energizes the heat relay. The controller will continue to cycle heating to maintain relative humidity below the selected set point. If dehumidification is terminated by a condition other than the humidity sensor, e.g., an out-of-range or compressor shutdown condition, the heat relay is de-energized immediately.

Two timers are activated during dehumidification to prevent rapid cycling and consequent contactor wear:

- Heater debounce timer (three minutes) - The heater debounce timer is started whenever the heater contactor status is changed. The heat contactor remains energized (or de-energized) for at least three minutes even if the set point criteria are satisfied.
- Out-of-range timer (five minutes) - The out-of-range timer is started to maintain heater operation during a temporary out-of-range condition. If supply air temperature remains outside of the user selected in-range setting for more than five minutes, the heaters will be de-energized to allow the system to recover. The out-of-range timer starts as soon as temperature exceeds in-range tolerance value set by Cd30.

4.3.9 Perishable Dehumidification - Bulb Mode

Bulb mode is an extension of dehumidification which allows changes to the evaporator fan speed and/or defrost termination set points.

Bulb mode is active when Cd35 is set to “Bulb.” Once bulb mode is activated, the user may then change dehumidification evaporator fan operation from the default (speed alternates from low to high each hour) to constant low or constant high speed. This is done by toggling Cd36 from its default of “alt” to “Lo” or “Hi” as desired. If low speed evaporator fan operation is selected, this gives the user the additional capability of selecting dehumidification set points from 50 to 95%.

In addition, if bulb mode is active, Cd37 may be set to override the previous defrost termination thermostat (DTT) settings. The temperature at which the DTT will be considered “open” may be changed [in 0.1°C (0.2°F) increments] to any value between 25.6°C (78°F) and 4°C (39.2°F). The temperature at which the DTT is considered closed for interval timer start or demand defrost is 10°C (50°F) for “open” values from 25.6°C (78°F) down to a 10°C (50°F) setting. For “open” values lower than 10°C, the “closed” values will decrease to the same value as the “open” setting. Bulb mode is terminated when:

- Bulb mode code Cd35 is set to “Nor.”
- Dehumidification code Cd33 is set to “Off.”
- The user changes the set point to one that is in the frozen range.

When bulb mode is disabled by any of the above conditions, evaporator fan operation for dehumidification reverts to “alt” and the DTS termination setting resets to the value determined by CnF41.

4.3.10 Perishable Economy

Economy fan mode is an extension of the Perishable Mode, and is provided for power saving purposes. Economy fan mode is activated when Cd34 (also used for Frozen Economy Mode) is set to “ON.” Economy fan mode is used in the transportation of temperature-tolerant cargo or non-respiration items which do not require high airflow for removing respiration heat.

There is no active display that indicates that economy fan mode has been initiated. To check for economy fan mode, perform a manual display of Cd34.

In order to initiate economy fan mode, a perishable set point must be selected prior to activation. When economy fan mode is active, the evaporator fans will be controlled as follows:

At the start of each cooling or heating cycle, the evaporator fans will run in high speed for three minutes. They will then be switched to low speed any time the supply air temperature is within +/- 0.2°C (0.36°F) of the set point and the return air temperature is less than or equal to the supply air temperature +3°C (5.4°F). The fans will continue to run in low speed for one hour. At the end of the hour, the evaporator fans will switch back to high speed and the cycle will be repeated. If bulb mode is active, economy fan mode will be overridden.

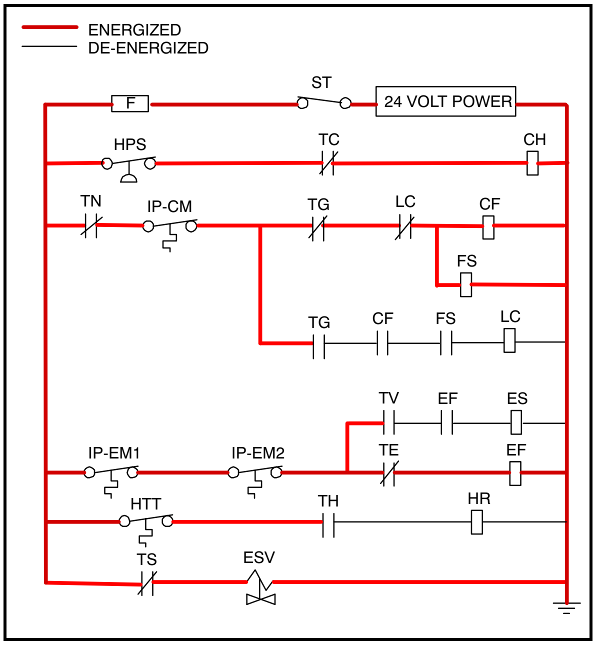
4.3.11 Perishable Mode Cooling - Sequence of Operation

NOTICE

In Standard Perishable Mode, the evaporator motors run in high speed. In Economy Fan Mode, the fan speed is varied.

a. When supply air temperature is above set point and decreasing, the unit will cool with the condenser fan motor (CF and FS), compressor motor (CH), evaporator fan motors (EF) energized, and the white COOL light illuminated. (See **Figure 4.6**).

Figure 4.6 Perishable Mode Cooling



b. When supply air temperature decreases to a predetermined tolerance above set point (Cd30), the green IN RANGE light is illuminated.

c. Condenser fan speed will change dependent on the following conditions:

Change high speed to low speed (LC):

Compressor loading ratio falls below 38%

Change low speed to high speed:

Compressor loading ratio above 45%

If compressor discharge pressure is above 200psig and condenser fan speed is high speed, then it will ratio.

d. The controller continuously monitors supply air temperature. Once the supply air temperature falls below set point, the controller periodically records supply air temperature, set point and time. A calculation is then performed to determine temperature drift from set point over time. If the calculation determines that cooling is no longer required, contacts TC and TN are opened to de-energize the compressor motor and the condenser fan motor. In addition the controller will close the EEV.

e. The evaporator fan motors continue to run to circulate air throughout the container. The green IN RANGE light remains illuminated as long as the supply air temperature is within tolerance of the set point.

f. If the supply air temperature increases to 0.2°C (0.36°F) above set point, contacts TC and TN close to restart the compressor and condenser fan motors in standard steady state operation. The white COOL light is also illuminated.

g. If the supply air increases more than 2.5°C (4.5°F) above set point temperature, contacts TS will close to energize and open the ESV, placing the unit in pull down mode.

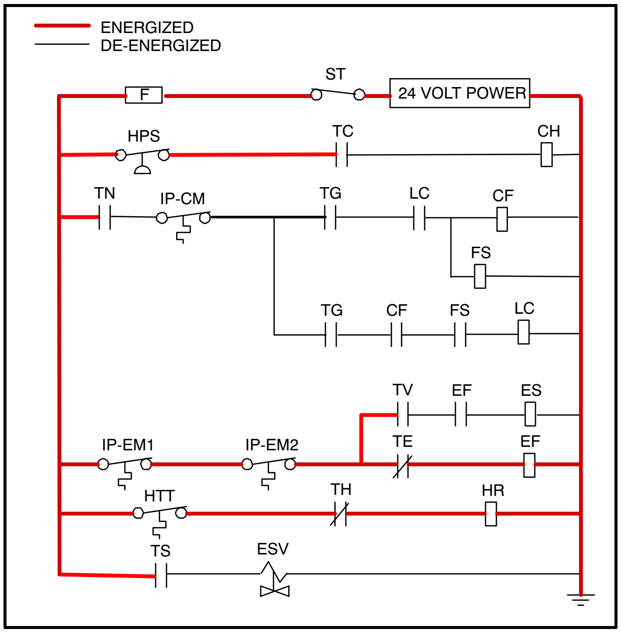
4.3.12 Perishable Mode Heating - Sequence of Operation

a. If the supply air temperature decreases 0.5°C (0.9°F) below set point, the system enters the heating mode. (See **Figure 4.5**). The controller closes contacts TH (see **Figure 4.7**) to allow power flow through the heat termination thermostat (HTT) to energize the heaters (HR). The orange HEAT light is also illuminated. The evaporator fans continue to run to circulate air throughout the container.

b. When the supply air temperature rises to 0.2°C (0.36°F) below set point, contact TH opens to de-energize the heaters. The orange HEAT light is also de-energized. The evaporator fans continue to run to circulate air throughout the container.

c. The safety heater termination thermostat (HTT) is attached to an evaporator coil circuit and will open the heating circuit if overheating occurs.

Figure 4.7 Perishable Mode Heating



NOTICE

The EEV and DUV are independently operated by the microprocessor. For full diagrams and legend, see Section 8.

4.3.13 Perishable Mode - Trim Heat

If the system capacity has been decreased to the lowest allowable capacity and conditions exist that warrant maximum temperature stability the controller will pulse the HR relay to energize the evaporator heaters in sequence with the compressor digital signal.

4.3.14 Frozen Mode - Temperature Control

In Frozen Mode, the controller maintains the return air temperature at set point, the yellow RETURN indicator light is illuminated, and the default reading on the display window is the return temperature sensor (RTS) reading.

When the return air temperature enters the in-range temperature tolerance (Cd30), the green IN-RANGE light will energize.

When CnF26 (Heat Lockout Temperature) is set to -10°C, frozen mode is active with set points *below -10°C (+14°F)*. When CnF26 is set to -5°C, frozen mode is active with set points *below -5°C (+23°F)*.

When the system is in Frozen Mode, the highest priority is given to bringing the container down to set point, the system will remain in economized operation.

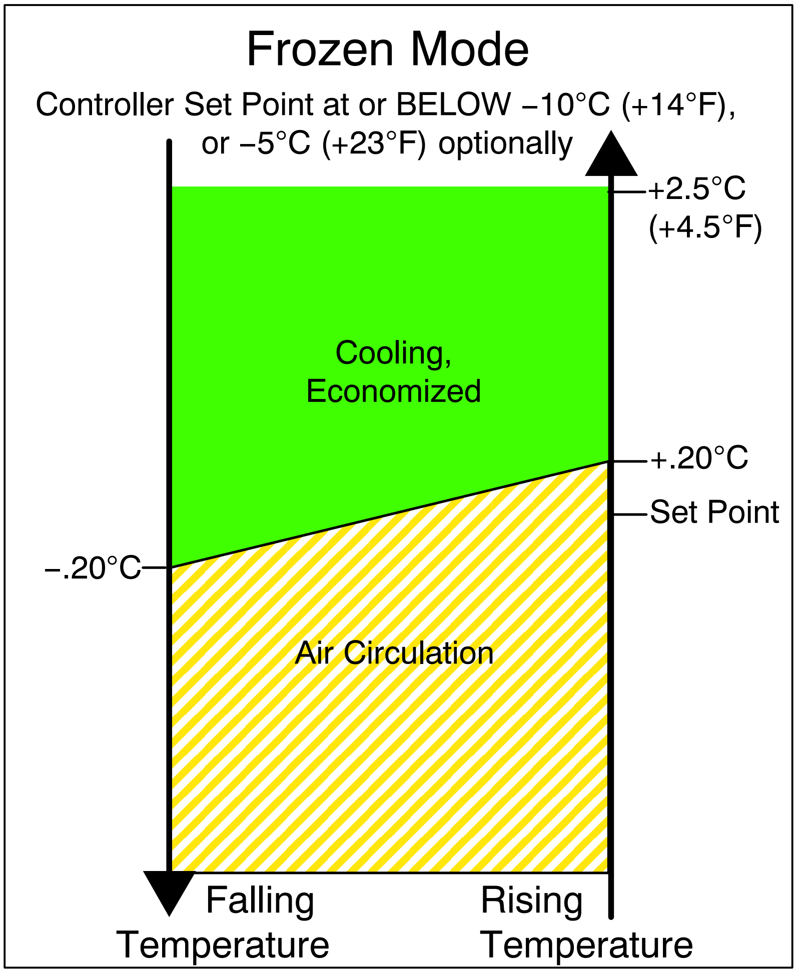
4.3.15 Frozen Steady State

Frozen cargos are not sensitive to minor temperature changes, and the frozen temperature control system takes advantage of this to greatly improve the energy efficiency of the unit. Frozen range temperature control is accomplished by cycling the compressor on and off as the load demand requires.

4.3.16 Frozen Idle Mode

When temperature drops to set point minus 0.2°C (0.4°F) and the compressor has run for at least five minutes, the unit will transition to the frozen idle mode. The compressor is turned off and the evaporator fans continue to run to circulate air throughout the container. If temperature rises above set point +0.2°C, (0.4°F) the unit will transition back to the frozen steady state mode.

Figure 4.8 Controller Operation - Frozen Mode



4.3.17 Frozen “Heat” Mode

If the temperature drops 10°C (18°F) below set point, the unit will transition to the frozen “heating” mode. The evaporator fans are brought to high speed, and the heat from the fans is circulated through the container. The unit will transition back to frozen steady state when the temperature rises back to the transition point.

4.3.18 Frozen Economy Mode

In order to activate Frozen Economy Mode, a frozen set point temperature must be selected, and Cd34 (Economy Mode) set to “ON.” When economy mode is active, the system will perform normal frozen mode operations except that the entire refrigeration system, excluding the controller, will be turned off when the control temperature is less than or equal to the set point -2°C (4°F).

After an off-cycle period of 60 minutes, the unit will turn on high speed evaporator fans for three minutes, and then check the control temperature. If the control temperature is greater than or equal to the frozen set point +0.2°C (0.4°F), the unit will restart the refrigeration system and continue to cool until the off-cycle temperature criteria are met. If the control temperature is less than the frozen set point +0.2°C (0.4°F) the unit will turn off the evaporator fans and restart another 60 minute off-cycle.

4.3.19 Frozen Mode Cooling - Sequence of Operation

a. When the return air temperature is above set point and decreasing, the unit will transition to economized cooling with the condenser fan motor (CF), compressor motor (CH), economizer solenoid valve (ESV), low speed evaporator fan motors (ES) energized and the white COOL light illuminated. (See **Figure 4.9**).

b. When the return air temperature decreases to a predetermined tolerance above set point, the green INRANGE light is illuminated.

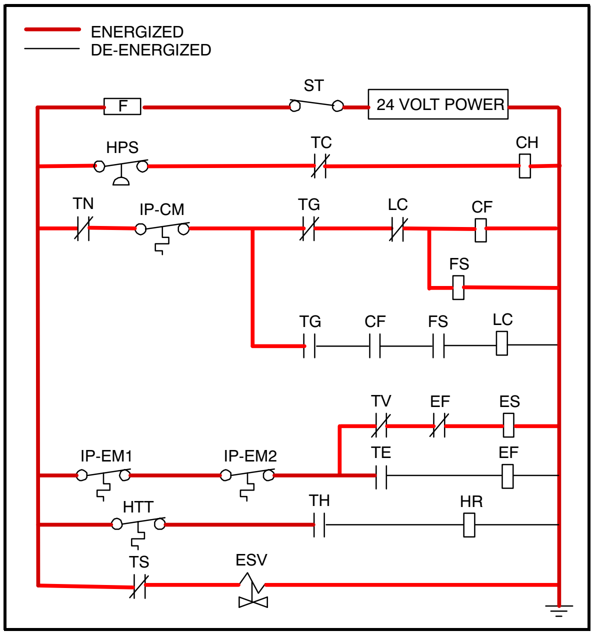
c. When the return air temperature decreases to 0.2°C (0.4°F) below set point, contacts TC, TS and TN are opened to de-energize the compressor, economizer solenoid valve and condenser fan motor. The white COOL light is also de-energized. The EEV will close.

d. The evaporator fan motors continue to run in low speed to circulate air throughout the container. The green IN-RANGE light remains illuminated as long as the return air is within tolerance of set point.

e. If return air temperature drops to 10°C (18°F) or more below set point, the evaporator fans increase to high speed.

f. When the return air temperature increases to 0.2°C (0.4°F) above set point and three minutes have elapsed, the EEV opens and contacts TC, TS and TN close to restart the compressor, open the ESV and restart the condenser fan motor. The white COOL is illuminated.

Figure 4.9 Frozen Mode



NOTICE

The EEV and DUV are independently operated by the microprocessor. Complete schematics and legends are located in Section 8.

4.3.20 Defrost

Defrost is initiated to remove ice buildup from the evaporator coil which can obstruct air flow and reduce the cooling capacity of the unit. The defrost cycle may consist of up to three distinct operations depending upon the reason for the defrost or model number configuration. The first is de-icing of the coil, the second is defrost due to a probe check cycle and the third is a snap freeze process based on the unit model configuration.

Defrosting the coil consists of removing power to the cooling components (compressor, evaporator fans, and condenser fan), closing the EEV, and turning on the heaters, which are located below the evaporator coil. During normal operation, de-icing will continue until temperatures indicate that the ice on the coil has been removed, proper air flow has been restored, and the unit is ready to control temperature efficiently.

If defrost was initiated by the probe check logic, then the Probe Check is carried out after the completion of the defrost cycle. A Probe Check is initiated only when there is an inaccuracy between the controller temperature sensors. For more information on Probe Check refer to **Section 5.11**.

Snap Freeze allows the system to cool for a period of time after de-icing, with the evaporator fans turned off and is only carried out if configured by model number. Snap-Freeze allows for the removal of latent de-icing heat from the evaporator coils, and freezes any remaining moisture that might otherwise be blown into the container.

4.3.21 Defrost Operation

Initiation of defrost is dependent on the state of the Defrost Temperature Sensor (DTS). When then (DTS) senses a temperature less than 10°C (50°F) the defrost options become active and the timer is engaged for the initiation of the defrost cycle. The defrost time accumulates when the compressor is running. In the perishable mode this is the same as real time as the compressor in general runs continuously. In frozen mode the actual time necessary to count down to the next defrost will exceed the defrost interval depending on the compressor duty-cycle.

When the defrost mode is in the active state, defrost can be initiated when any one of the following additional conditions become true:

1. **Manually:** A manual defrost is initiated by pressing the MANUAL DEFROST/INTERVAL key for greater than 5 seconds.
2. **Timer:** The Defrost Interval Timer reaches the user selectable Interval. The user-selected intervals are (OFF), 3, 6, 9, 12, 24 hours, AUTO, or PuLS; factory default is 3 hours. Refer to code select CD27 (**Table 4–2**).
    a. Automatic defrost starts with an initial defrost at three hours and then adjusts the interval to the next defrost based on the accumulation of ice on the evaporator coil. Following a start-up or after termination of defrost, the time will not begin counting down until the DTS reading falls below 10°C (50°F). If the reading of DTS rises above termination setting any time during the timer count down, the interval is reset and the countdown starts over. The Auto defrost time is reset to three hours start time after every PTI initiation or trip start interval.
    b. Fan Pulsing Logic is used to help prevent ice formation in the drain gutter and drain cup and ice buildup in supply air channel by using the evaporator fans to blow the warm air onto these areas during unit defrost. When cooling at lower setpoints, evaporator fan pulsing can be used during Defrost/De-ice when the "PuLS" option is selected in the Defrost Interval function select code. When enabled, evaporator fan pulsing will occur based on the unit temperature setpoint and the Evaporator Fan Pulsing Temperature Setting (Cd60). QUEST II also pulses the evaporator fans during Defrost/De-ice within a narrow perishable setpoint range. The logic for each evaporator fan pulsing feature is described below.
    c. After a new Defrost Interval is selected, the previously selected Interval is used until the next defrost termination, the next time the DTS contacts are OPEN, or the next time power to the control is interrupted. If the previous value or the new value is "OFF", the newly selected value will be used immediately.
3. **Probe Check:** If defrost is initiated due to Probe Check immediately following the defrost cycle the evaporation fans are started and run for eight minutes to stabilize the temperature throughout the container. A probe check comparison is carried out at the end of the eight minute period if any sensor is found out of calibration. At this time its alarm set is no longer used for control/reorder purposes.
4. **Probe Check Logic:** The logic determines that a Probe Check is necessary based on temperature values currently reported by the supply and return probes.
5. **Remote:** An Initiate Defrost command is sent via communications.

6. **Delta T Logic:** If the difference between return and supply air temperature (Delta T) becomes too great indicating possible reduced airflow over the evaporator coil caused by ice buildup requiring a defrost.
    a. In Perishable Pull Down - Delta T increases to greater than 12°C, and 90 minutes of compressor run time have been recorded.
    b. In Perishable Steady State – A baseline Delta T is recorded following the first defrost cycle after steady state conditions are reached, (the unit is cooling, and the evaporator fans and heaters must remain in a stable state for a period of five minutes). Defrost will be initiated if Delta T increases to greater than 4°C above the baseline, and 90 minutes of compressor run time have been recorded.
    c. In Frozen Mode - Defrost will be initiated if Delta T increases to greater than 16°C and 90 minutes of compressor run time have been recorded.

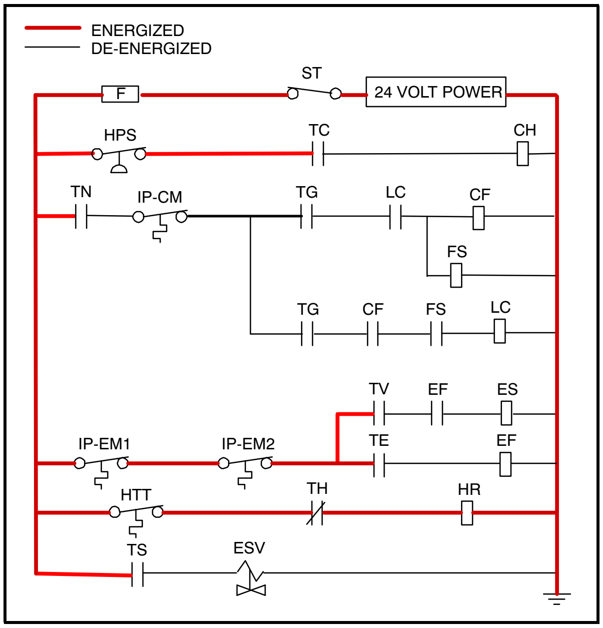
NOTICE

When defrost is initiated, the controller closes the EEV, opens contacts TC, TN and TE (or TV) to de-energize the compressor, condenser fan and evaporator fans.

NOTICE

The controller then closes contacts TH to supply power to the heaters. The orange DEFROST light and heat light are illuminated and the COOL light is also de-energized.

Figure 4.10 Defrost



The EEV and DUV are independently operated by the microprocessor. Complete schematics and legends are located in **Section 8**.

Defrost will terminate when the DTS reading rises above one of two model number configurable options selection, either an upper setting of 25.6°C (78°F) which is default or lower setting of 18°C (64°F).

When the DTS reading rises to the configured setting, the de-icing operation is terminated.

4.3.22 Defrost Related Parameters

DTS Failure

When the return air temperature falls to 7°C (45°F), the controller ensures that the defrost temperature sensor (DTS) reading has dropped to 10°C or below. If it has not, it indicates a failed DTS. A DTS failure alarm is triggered and the defrost mode is operated by the return temperature sensor (RTS). Defrost will terminate after 1 hour. If the DTS fails to reach is termination setting, the defrost terminate after 2 hours of operation.

Defrost Timer

If CnF23 is configured to “SAv” (save), then the value of the defrost interval timer will be saved at power down and restored at power up. This option prevents short power interruptions from resetting an almost expired defrost interval, and possibly delaying a needed defrost cycle. If the save option is not selected the defrost timer will re-initiate and begin recounting.

If CnF11 is model number configured to OFF the operator will be allowed to choose “OFF” as a defrost interval option.

If CnF64 is configured in the operator will be allowed to choose “PuLS” as a defrost interval option. For units operating with “PuLS” selected, defrost interval is determined by the unit temperature setpoint and the Evaporator Fan Pulsing Temperature Setting (Cd60). When the unit temperature setpoint is equal to or less than the Evaporator Fan Pulsing Temperature Setting, the defrost interval is set to 6 hours. Otherwise, the defrost interval is determined using the Automatic Defrost Interval Determination logic. In either case, “PuLS” remains displayed in this function select code.

If any Auto Pretrip sequence is initiated, Cd27 will be set to ’AUTO’ unless CnF49 (OEM Reset) is set to “Custom” AND CnF64 (Evaporator Fan Pulsing Logic) configuration variable is set to IN, in which case Cd27 will be set to “PuLS”.

If defrost does not terminate correctly and temperature reaches the set point of the Heat Termination Thermostat (HTT) 54°C (130°F), the HTT will open to de-energize the heaters (AL59 & AL60). If the HTT does not open and termination does not occur within two hours, the controller will terminate defrost. AL60 will be activated to inform of a possible DTS failure.

4.4 Protection Modes of Operation

4.4.1 Evaporator Fan Operation

Opening of an evaporator fan internal protector will shut down the unit.

4.4.2 Failure Action

Function code Cd29 may be operator set to select action the controller will take upon system failure. The factory default is full system shutdown. Refer to **Table 4–3**.

4.4.3 Generator Protection

Function codes Cd31 (Stagger Start, Offset Time) and Cd32 (Current Limit) may be operator set to control the start up sequence of multiple units and operating current draw. The factory default allows on demand starting (no delay) of units and normal current draw. Refer to **Table 4–3**.

4.4.4 Compressor High Temperature Protection

The controller continuously monitors compressor discharge pressure and temperature, and suction pressure. If discharge pressure or temperature rises above the allowed limit or suction pressure falls below the allowed limit, the compressor will be cycled off and on every 3 minutes. Condenser and evaporator fans will continue to operate during the compressor off cycle.

If high compressor dome temperature occurs, as measured by the CPDS, the controller will allow additional refrigerant to be released into the system in order to provide cooling to the evaporator coil and compressor dome. The controller is alerted to high compressor dome temperatures via the CPDS when ambient temperature is greater than 43.3°C, return air temperature is less than -17.5°C and the compressor discharge temperature is greater than 117.7°C.

Dome temperature control logic will disengage when return air temperature and ambient temperature return to allowed limits or when the compressor turns off.

4.4.5 Compressor Low Pressure Protection

If the suction pressure low limit is triggered, the DUV will energize to raise the suction pressure.

4.4.6 Perishable Mode - System Pressure Regulation

In perishable mode, system pressures may need to be regulated at ambient temperatures of 20°C (68°F) and below. Once below this ambient temperature, the condenser fan may cycle on and off based on limits imposed for discharge pressure. For extremely cold ambient temperatures, -18°C (0°F), heater cycling may occur within normal system operation based on discharge pressure limits.

4.4.7 Condenser Fan Override

When CnF17 (Discharge Temperature Sensor) is set to “In” and CnF48 (Condenser Fan Switch Override) is set to “On”, the condenser fan switch override logic is activated. If condenser cooling water pressure is sufficient to open the water pressure switch (de-energizing the condenser fan) when water flow or pressure conditions are not maintaining discharge temperature, the logic will energize the condenser fan as follows:

1. If the DLV/DUV is cycling at less than 80% capacity when the controller calls for it to be 100% open, the condenser fan is energized. When the DLV/DUV regains full capacity, the fan will de-energize.
2. If DPT reading is invalid or out of range (AL65), the condenser fan is energized and will remain energized until system power is cycled.
3. If the system is running on condenser fan override and the high pressure switch opens, the condenser fan is energized and will remain energized until the system power is cycled.

4.5 QUEST - CCPC

Compressor-Cycle Perishable Cooling (CCPC) is a method of temperature control used during steady-state perishable cooling that cycles the compressor on and off according to return air temperature.

To be eligible for steady-state control the unit must first complete a setpoint pulldown phase and a CCPC pulldown phase:

During setpoint pulldown supply air temperature is controlled according to the unit’s nominal supply air setpoint.

During CCPC pulldown the supply air temperature is lowered somewhat relative to the nominal setpoint. Evaporator fans are forced to operate at high speed.

Steady-state CCPC control maintains the same lowered supply air temperature that was used during CCPC pulldown. The compressor cycles on and off according to return air high and low limits. Depending on the fan mode of operation selected, the evaporator fans may be programmed to run at low speed some or all of the time according to the control logic.

4.6 Controller Alarms

Alarm display is an independent controller software function. If an operating parameter is outside of expected range or a component does not return the correct signals back to the controller, an alarm is generated. A listing of the alarms is provided in **Table 4–6**.

The alarm philosophy balances the protection of the refrigeration unit and that of the refrigerated cargo. The action taken when an error is detected always considers the survival of the cargo. Rechecks are made to confirm that an error actually exists.

Some alarms requiring compressor shutdown have time delays before and after to try to keep the compressor on line. An example is alarm code “LO,” (low main voltage), when a voltage drop of over 25% occurs, an indication is given on the display, but the unit will continue to run.

When an Alarm Occurs:

a. The red ALARM light will energize for critical alarm code numbers 17, 20, 21, 22, 23, 24, 25, 26, and 27.

b. If a detectable problem exists, its alarm code will be alternately displayed with the set point on the left display.

c. The user should scroll through the alarm list to determine what alarms exist or have existed. Alarms must be diagnosed and corrected before the Alarm List can be cleared.

To Display Alarm Codes:

1. While in the Default Display mode, press the ALARM LIST key. This accesses the Alarm List Display Mode, which displays any alarms archived in the alarm queue.
2. The alarm queue stores up to 16 alarms in the sequence in which they occurred. The user may scroll through the list by depressing an ARROW key.
3. The left display will show “AL##,” where ## is the alarm number sequentially in the queue.
4. The right display will show the actual alarm code. “AA##” will display for an active alarm, where “##” is the alarm code. Or “IA##” will display for an inactive alarm, refer to **Table 4–6**.
5. “END” is displayed to indicate the end of the alarm list if any alarms are active.
6. “CLEAr” is displayed if all alarms are inactive. The alarm queue may then be cleared by pressing the ENTER key. The alarm list will clear and “-----” will be displayed.

NOTICE

AL26 is active when all of the sensors are not responding. Check the connector at the back of the controller; if it is loose or unplugged, reconnect it, then run a Pre-trip test (P5) to clear AL26.

4.7 Pre-Trip Diagnostics

Pre-trip Diagnostics is an independent controller function that suspends normal refrigeration controller activities and provides preprogrammed test routines. The test routine can be run in Auto Mode, which automatically performs a pre programmed sequence of tests, or Manual Mode, which allows the operator to select and run any of the individual tests.

⚠ CAUTION

Pre-trip diagnostics should not be performed with critical temperature cargoes in the container.

⚠ CAUTION

When PRE-TRIP key is pressed, economy, dehumidification and bulb mode will be deactivated. At the completion of Pre-trip activity, economy, dehumidification and bulb mode must be reactivated.

A Pre-trip test may be initiated by use of the keypad or via communication, but when initiated by communication the controller will execute the entire battery of tests (auto mode).

At the end of a Pre-trip test, the message “P,” “rSLts” (pretest results) will be displayed. Pressing ENTER will allow the user to see the results for each of the sub-tests. The results will be displayed as “PASS” or “FAIL” for each test run to completion.

A detailed description of the Pre-trip tests and test codes is provided in **Table 4–4**. Detailed operating instructions are provided in **Section 5.10**.

4.8 DataCORDER

4.8.1 Description

Carrier Transicold “DataCORDER” software is integrated into the controller and serves to eliminate the temperature recorder and paper chart. DataCORDER functions may be accessed by keypad selections and viewed on the display module. The unit is also fitted with interrogation connections (see **Figure 4.1**) which may be used with the Carrier Transicold DataReader to download data. A personal computer with Carrier Transicold DataLINE software installed may also be used to download data and configure settings.

DataCORDER settings:

- Configuration Software
- Operational Software
- Data Storage Memory
- Real Time Clock (with internal battery backup)
- Six Thermistor Inputs
- Interrogation Connections
- Power Supply (battery pack)

DataCORDER functions:

a. Logs data at 15, 30, 60 or 120 minute intervals and stores two years of data (based on one hour interval).

b. Records and displays alarms on the display module.

c. Records results of Pre-trip testing.

d. Records DataCORDER and temperature control software generated data and events as follows:
    - Container ID Change
    - Software Upgrades
    - Alarm Activity
    - Battery Low (battery pack)
    - Data Retrieval
    - Defrost Start and End
    - Dehumidification Start and End
    - Power Loss (with and without battery pack)
    - Power Up (with and without battery pack)
    - Remote Probe Temperatures in the Container (USDA Cold treatment and Cargo probe recording)
    - Return Air Temperature
    - Set Point Change
    - Supply Air Temperature
    - Real Time Clock Battery (Internal) Replacement
    - Real Time Clock Modification
    - Trip Start
    - ISO Trip Header (When entered via Interrogation program)
    - Economy Mode Start and End
    - “Auto 1/Auto 2/Auto 3” Pre-trip Start and End
    - Bulb Mode Start
    - Bulb Mode Changes
    - Bulb Mode End
    - USDA Trip Comment
    - Humidification Start and End
    - USDA Probe Calibration
    - Fresh Air Vent Position

4.8.2 DataCORDER Software

The DataCORDER Software is subdivided into Operational Software, Configuration Software, and the Data Memory.

Operational Software

The Operational Software reads and interprets inputs for use by the Configuration Software. The inputs are labeled Function Codes. Controller functions (see **Table 4–5**) which the operator may access to examine the current input data or stored data. To access these codes, do the following:

1. Press the ALT. MODE and CODE SELECT keys.
2. Press an arrow key until the left window displays the desired code number. The right window will display the value of this item for five seconds before returning to the normal display mode.
3. If a longer display time is desired, press the ENTER key to extend the display time to five minutes.

Configuration Software

The recording and alarm functions of the DataCORDER are based on the configurations. Reprogramming to the factory installed configuration is achieved via a configuration card. Changes to the unit DataCORDER configuration may be made using the DataLINE interrogation software.

A listing of the configuration variables is provided in **Table 4–2**. Descriptions of DataCORDER operation for each variable setting are provided in the following paragraphs.

4.8.3 Sensor Configuration (dCF02)

Two modes of operation may be configured: the Standard Mode and the Generic Mode.

Standard Mode

In Standard Mode, the user may configure the DataCORDER to record data using one of seven standard configurations.

The seven standard configuration variables, with their descriptions, are listed in **Table 4–3**.

The inputs of the six thermistors (supply, return, USDA #1, #2, #3 and cargo probe) and the humidity sensor input will be generated by the DataCORDER. **Figure 4.11**

NOTICE

The DataCORDER software uses the supply and return recorder sensors (SRS, RRS). The temperature control software uses the supply and return temperature sensors (STS, RTS).

Generic Mode

Generic recording mode allows user selection of the network data points to be recorded. The user may select up to a total of eight data points for recording. A list of data points available for recording follows. Changing the configuration to generic and selecting which data points to record may be done using the Carrier Transicold Data Retrieval Program.

1. Control mode
2. Control temperature
3. Frequency
4. Humidity
5. Phase A current
6. Phase B current
7. Phase C current
8. Main voltage
9. Evaporator expansion valve percentage
10. Discrete outputs (Bit mapped - require special handling if used)

11. Discrete inputs (Bit mapped - require special handling if used)
12. Ambient temperature sensor (AMBS)
13. Evaporator temperature sensor (ETS)
14. Compressor discharge sensor (CPDS)
15. Return temperature sensor (RTS)
16. Supply temperature sensor (STS)
17. Defrost temperature sensor (DTS)
18. Discharge pressure transducer (DPT)
19. Suction pressure transducer (SPT)
20. Flash tank pressure transducer (FPT)
21. Vent position sensor (VPS)

- - - - -

4.8.4 Logging Interval (dCF03)

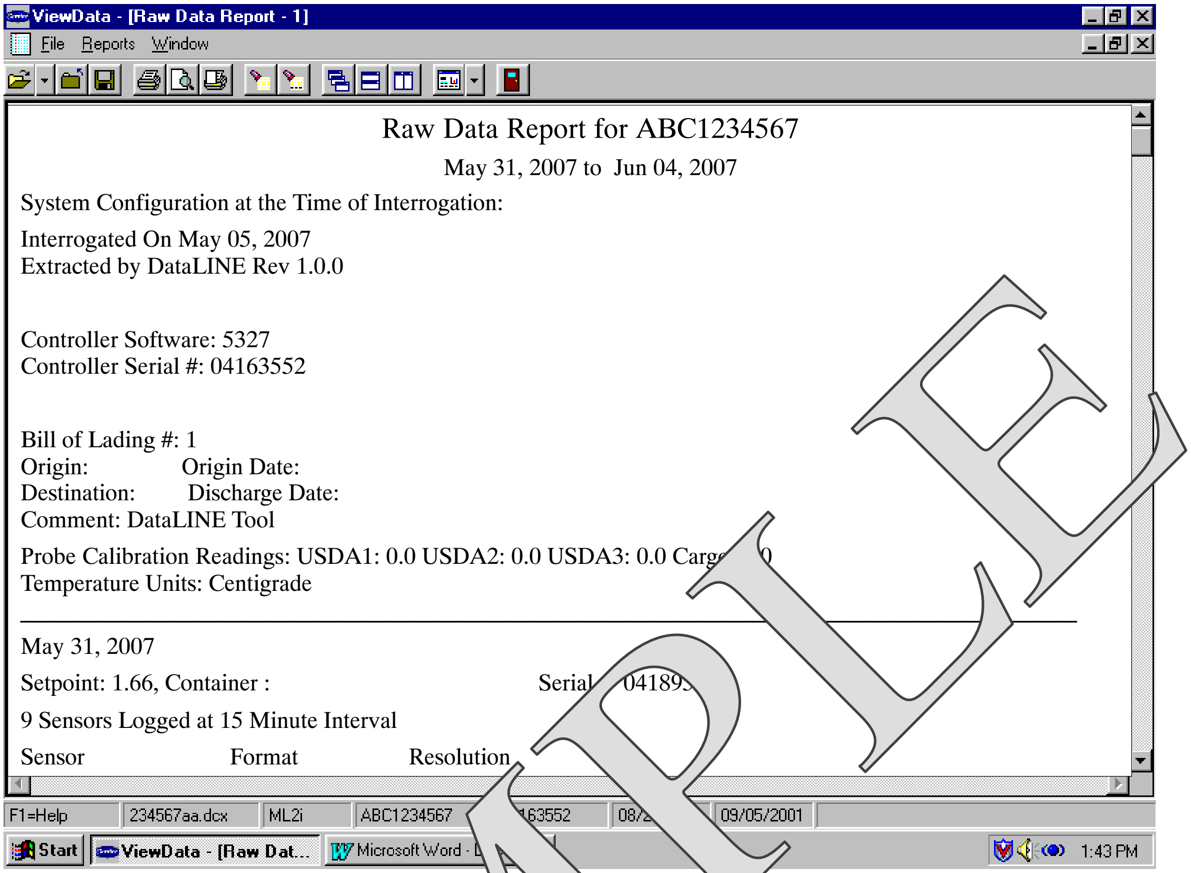
The user may select four different time intervals between data recordings. Data is logged at exact intervals in accordance with the real time clock. The clock is factory set at Greenwich Mean Time (GMT).

4.8.5 Thermistor Format (dCF04)

The user may configure the format in which thermistor readings are recorded. The short resolution is a 1 byte format and the long resolution is a 2 byte format. The short requires less memory and records temperature with variable resolutions depending on temperature range. The long records temperature in 0.01°C (0.02°F) steps for the entire range.

Config	Title	Default	Option
dCF01	(Future Use)	--	--
dCF02	Sensor Configuration	2	2, 5, 6, 9, 54, 64, 94
dCF03	Logging Interval (Minutes)	60	15, 30, 60, 120
dCF04	Thermistor Format	Short	Long
dCF05	Thermistor Sampling Type	A	A, b, C
dCF06	Controlled Atmosphere / Humidity Sampling Type	A	A, b
dCF07	Alarm Configuration USDA Sensor 1	A	Auto, On, Off
dCF08	Alarm Configuration USDA Sensor 2	A	Auto, On, Off
dCF09	Alarm Configuration USDA Sensor 3	A	Auto, On, Off
dCF10	Alarm Configuration Cargo Sensor A	A	Auto, On, Off

Figure 4.11 Standard Configuration Download Report



Raw Data Report for ABC1234567

May 31, 2007 to Jun 04, 2007

System Configuration at the Time of Interrogation:

Interrogated On May 05, 2007
Extracted by DataLINE Rev 1.0.0

Controller Software: 5327
Controller Serial #: 04163552

Bill of Lading #: 1
Origin: Origin Date:
Destination: Discharge Date:
Comment: DataLINE Tool

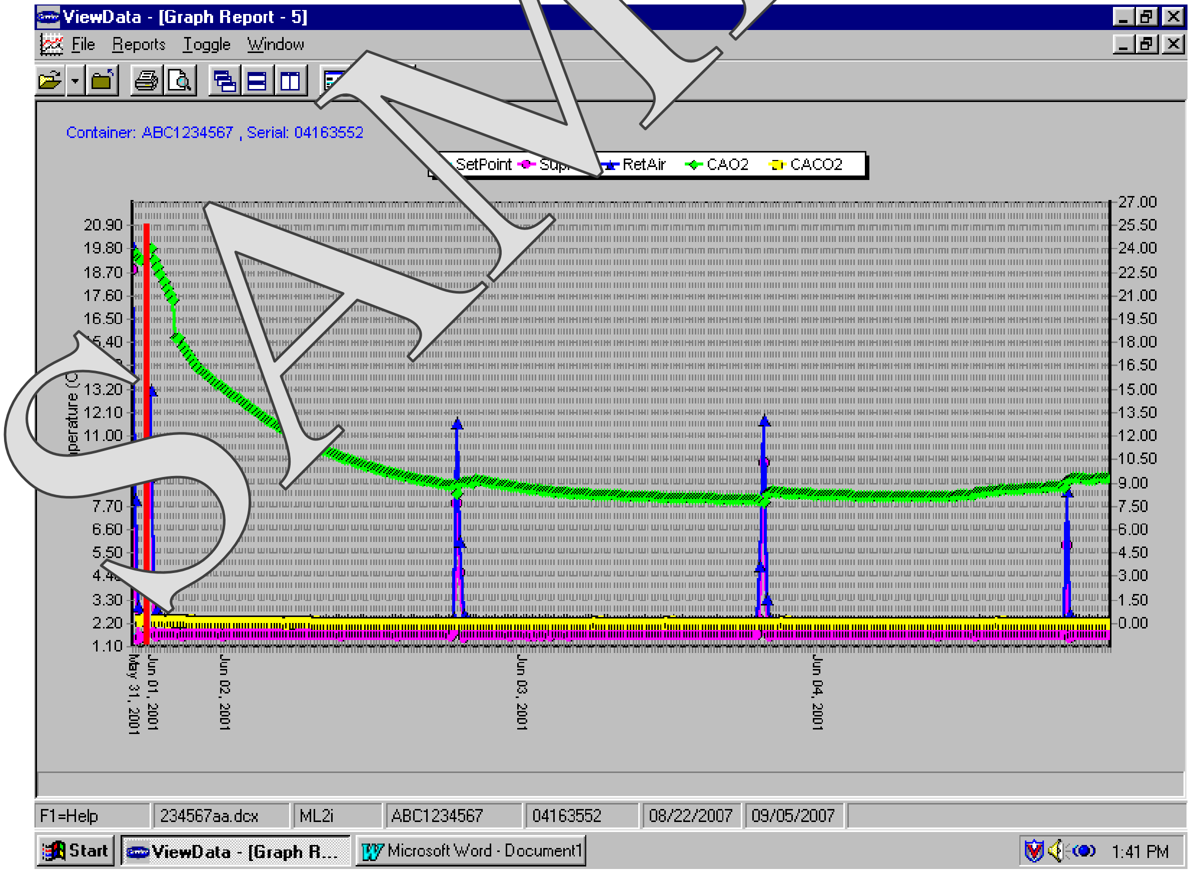
Probe Calibration Readings: USDA1: 0.0 USDA2: 0.0 USDA3: 0.0 Carg 0
Temperature Units: Centigrade

May 31, 2007

Setpoint: 1.66, Container : Serial 04189

9 Sensors Logged at 15 Minute Interval

Sensor Format Resolution



Standard Configuration	Description
2 sensors (dCF02=2)	2 thermistor inputs (supply & return)
5 sensors (dCF02=5)	2 thermistor inputs (supply & return) 3 USDA thermistor inputs
6 sensors (dCF02=6)	2 thermistor inputs (supply & return) 3 USDA thermistor inputs 1 humidity input
9 sensors (dCF02=9)	Not Applicable
6 sensors (dCF02=54)	2 thermistor inputs (supply & return) 3 USDA thermistor inputs 1 cargo probe (thermistor input)
7 sensors (dCF02=64)	2 thermistor inputs (supply & return) 3 USDA thermistor inputs 1 humidity input 1 cargo probe (thermistor input)

4.8.6 Sampling Type (dCF05 & dCF06)

Three types of data sampling are available: average, snapshot and USDA. When configured to average, the average of readings taken every minute over the recording period is recorded. When configured to snapshot, the sensor reading at the log interval time is recorded. When USDA is configured, supply and return temperature readings are averaged and the three USDA probe readings are snapshot.

4.8.7 Alarm Configuration (dCF07 - dCF10)

USDA and cargo probe alarms may be configured to OFF, ON or AUTO.

If a probe alarm is configured to OFF, the alarm for this probe is always disabled.

If a probe alarm is configured to ON, the associated alarm is always enabled.

If the probes are configured to AUTO, they act as a group. This function is designed to assist users who keep the DataCORDER configured for USDA recording, but do not install the probes for every trip. If all the probes are disconnected, no alarms are activated. As soon as one of the probes is installed, all of the alarms are enabled and the remaining probes that are not installed will give active alarm indications.

4.8.8 DataCORDER Power Up

The DataCORDER may be powered up in any one of four ways:

1. Normal AC power: The DataCORDER is powered up when the unit is turned on via the Stop-Start switch.
2. Controller DC battery pack power: If a battery pack is installed, the DataCORDER will power up for communication when an interrogation cable is plugged into an interrogation receptacle.
3. External DC battery pack power: A 12 volt battery pack may also be plugged into the back of the interrogation cable, which is then plugged into an interrogation port. No controller battery pack is required with this method.
4. Real Time Clock demand: If the DataCORDER is equipped with a charged battery pack and AC power is not present, the DataCORDER will power up when the real time clock indicates that a data recording should take place. When the DataCORDER is finished recording, it will power down.

During DataCORDER power-up, while using battery-pack power, the controller will perform a hardware voltage check on the battery. If the hardware check passes, the controller will energize and perform a software battery voltage check before DataCORDER logging. If either test fails, the real time clock battery power-up will be disabled until the next AC power cycle. Further DataCORDER temperature logging will be prohibited until that time.

An alarm will be generated when the battery voltage transitions from good to bad indicating that the battery pack needs recharging. If the alarm condition persists for more than 24 hours on continuous AC power, it indicates that the battery pack needs replacement.

4.8.9 Pre-Trip Data Recording

The DataCORDER will record the initiation of a Pre-trip test (refer to **Section 5.10**) and the results of each test included in Pre-trip. The data is time-stamped and may be extracted via the Data Retrieval program. Refer to **Table 4–6** for a description of the data stored in the DataCORDER for each corresponding Pre-trip test.

4.8.10 DataCORDER Communications

Data retrieval from the DataCORDER can be accomplished by using the DataLINE, DataBANK Card, or a communications interface module.

NOTICE

A DataLINE or a communications interface module display of Communication Failed is caused by faulty data transfer between the DataCORDER and the data retrieval device.
Common causes include:

1. **Bad cable or connection between DataCORDER and data retrieval device.**
2. **PC communication port(s) unavailable or mis-assigned.**

Configuration identification for the models covered herein may be obtained on the Container Products Group Information Center by authorized Carrier Transicold Service Centers.

a. DataLINE

The DataLINE software for a personal computer is supplied on both floppy disks and CD. This software allows interrogation, configuration variable assignment, screen view of the data, hard copy report generation, cold treatment probe calibration and file management. Refer to Data Retrieval manual 62-10629 for a more detailed explanation of the DataLINE interrogation software. The DataLINE manual may be found on the internet at www.container.carrier.com.

b. DataBANK Card

The DataBANK™card is a PCMCIA card that interfaces with the controller through the programming slot and can download data at a fast rate. Files downloaded to DataBANK card files are accessible through an Omni PC Card Drive. The files can then be viewed using the DataLINE software.

c. Communications Interface Module

The communications interface module is a slave module, which allows communication with a master central monitoring station. The module will respond to communication and return information over the main power line.

With a communications interface module installed, all functions and selectable features that are accessible at the unit may be performed at the master station. Retrieval of all DataCORDER reports may also be performed. Refer to the master system technical manual for further information.

4.8.11 USDA Cold Treatment

Sustained cold temperature has been employed as an effective postharvest method for the control of Mediterranean and certain other tropical fruit flies. Exposing infested fruit to temperatures of 2.2°C (36°F) or below for specific periods results in the mortality of the various stages of this group of insects.

In response to the demand to replace fumigation with this environmentally sound process, Carrier has integrated Cold Treatment capability into its microprocessor system. These units have the ability to maintain supply air temperature within one quarter degree Celsius of set point and record minute changes in product temperature within the DataCORDER memory, thus meeting USDA criteria. Information on USDA is provided in the following sub-paragraphs.

a. USDA Recording

A special type of recording is used for USDA cold treatment purposes. Cold treatment recording requires three remote temperature probes be placed at prescribed locations in the cargo. Provision is made to connect these probes to the DataCORDER via receptacles located at the rear left-hand side of the unit. Four or five receptacles are provided. The four 3-pin receptacles are for the probes. The 5-pin receptacle is the rear connection for the Interrogator. The probe receptacles are sized to accept plugs with tricam coupling locking devices. A label on the back panel of the unit shows which receptacle is used for each probe.

The standard DataCORDER report displays the supply and return air temperatures. The cold treatment report displays USDA #1, #2, #3 and the supply and return air temperatures. Cold treatment recording is backed up by a battery so recording can continue if AC power is lost.

b. USDA/ Message Trip Comment

A special feature in DataLINE allows the user to enter a USDA (or other) message in the header of a data report. The maximum message length is 78 characters. Only one message will be recorded per day.

4.8.12 USDA Cold Treatment Procedure

The following is a summary of the steps required to initiate a USDA Cold Treatment:

a. Calibrate the three USDA probes by ice bathing the probes and performing the calibration function with the DataLINE. This calibration procedure determines the probe offsets and stores them in the controller for use in generating the cold treatment report. Refer to the Data Retrieval manual 62-10629 for more details.

b. Pre-cool the container to the treatment temperature or below.

c. Install the DataCORDER module battery pack (if not already installed).

d. Place the three probes. The probes are placed into the pulp of the product (at the locations defined in the following table) as the product is loaded.

Sensor 1	Place in pulp of the product located next to the return air intake.
Sensor 2	Place in pulp of the product five feet from the end of the load for 40 foot containers, or three feet from the end of the load for 20 foot containers. This probe should be placed in a center carton at one-half the height of the load.
Sensor 3	Place in pulp of product five feet from the end of the load for 40 foot containers or three feet from the end of the load for 20 foot containers. This probe should be placed in a carton at a side wall at one-half the height of the load.

e. To initiate USDA recording, connect the personal computer and perform the configuration as follows, using the DataLINE software:

1. Enter ISO header information.
2. Enter a trip comment if desired.
3. Configure the DataCORDER for five probes (s, r, P1, P2, P3) (dcf02=5).
4. Configure the logging interval for one hour.
5. Set the sensor configuration to “USDA.”
6. Configure for two byte memory storage format (dcf04=LONG).
7. Perform a “trip start.”

4.8.13 DataCORDER Alarms

The alarm display is an independent DataCORDER function. If an operating parameter is outside of the expected range or a component does not return the correct values to the DataCORDER, an alarm is generated. The DataCORDER contains a buffer of up to eight alarms. A listing of the DataCORDER alarms is provided in **Table 4–7**. Refer to **Section 4.8.7** for configuration information.

Displaying Alarm Codes:

1. While in the Default Display mode, press the ALT. MODE & ALARM LIST keys. This accesses the DataCORDER Alarm List Display Mode, which displays any alarms stored in the alarm queue.
2. To scroll to the end of the alarm list, press the UP ARROW. Depressing the DOWN ARROW key will scroll the list backward.
3. The left display will show “AL#” where # is the alarms number in the queue. The right display will show “AA##,” if the alarm is active, where ## is the alarm number. “IA##,” will show if the alarm is inactive.
4. “END” is displayed to indicate the end of the alarm list if any alarms are active. “CLEAr” is displayed if all the alarms in the list are inactive.
5. If no alarms are active, the alarm queue may be cleared. The exception to this rule is the DataCORDER alarm queue Full alarm (AL91), which does not have to be inactive in order to clear the alarm list.

Clearing the Alarm List:

1. Press the ALT. MODE & ALARM LIST keys.
2. Press the UP/DOWN ARROW key until “CLEAr” is displayed.
3. Press the ENTER key. The alarm list will clear and “-----” will be displayed.
4. Press the ALARM LIST key. “AL” will show on the left display and “-----” on the right display when there are no alarms in the list.
5. Upon clearing of the alarm queue, the alarm light will be turned off.

4.8.14 ISO Trip Header

DataLINE provides the user with an interface to view/modify current settings of the ISO trip header through the ISO Trip Header screen.

The ISO Trip Header screen is displayed when the user clicks on the “ISO Trip Header” button in the “Trip Functions” Group Box on the System Tools screen.

F9 function - Provides the user with a shortcut for manually triggering the refresh operation. Before sending modified parameter values, the user must ensure that a successful connection is established with the controller.

If the connection is established with the DataCORDER, the current contents of the ISO Trip Header from the DataCORDER will be displayed in each field. If the connection is not established with the DataCORDER, all fields on the screen will be displayed as “Xs.” If at any time during the display of the ISO Trip Header screen the connection is not established or is lost, the user is alerted to the status of the connection.

After modifying the values and ensuring a successful connection has been made with the DataCORDER, click on the “Send” button to send the modified parameter values.

The maximum allowed length of the ISO Trip Header is 128 characters. If the user tries to refresh the screen or close the utility without sending the changes made on the screen to the DataCORDER, the user is alerted with a message.

4.9 Controller Configuration Variables

NOTICE

Configuration numbers with an “ * ” must be changed to the bold option for a default controller to operate on a PrimeLINE Edge Unit.

Configuration numbers with a bold option should be changed for a default controller to operate on a PrimeLINE Edge Unit.

Table 4–2 Controller Configuration Variables

Config	Title	Default	Option
CnF02	Evaporator Fan Speed	dS (Dual)	SS (Single)
CnF03	Control Temperature Sensors	FOUr	duAL
CnF04	Enable Dehumidification	On	OFF
CnF06 *	Variable Speed Condenser Fan	OFF	On
CnF08	Evaporator Motor Type	1Ph	3Ph
CnF09	Refrigerant Selection	r134a	r744
CnF11	Defrost “Off” Selection	noOFF	OFF
CnF15	Enable Discharge Temperature Sensor	Out	In
CnF17	Enable Discharge Pressure Transducer	Out (No)	In (Yes)
CnF18	Heater Type	Old (Low Watt)	nEW (High Watt)
CnF20	Enable Suction Pressure Transducer	Out (No)	In (Yes)
CnF22	Economy Mode	OFF	Std, Full
CnF23	Enable Defrost Interval Save	noSAv	SAv
CnF24	Enable Long Pre-trip Test Series	Auto	Auto2, Auto 3
CnF25	Enable Pre-trip Data Recording	rSLtS	dAtA
CnF26	Heat Lockout Temperature	Set to -10C	Set to -5C
CnF27	Enable Suction Temperature Sensor	Out	In
CnF28	Enable Bulb Mode	NOr	bULb
CnF31	Probe Check	SPEC	Std
CnF33	Enable Snap Freeze	OFF	SnAP
CnF34	Temperature Unit Display	bOth	F
CnF41	Enable Low DTT Setting	Out	In
CnF44	Autoslide Enable	Out	LO, UP
CnF45	Low Humidity Enabled	Out	In
CnF47	Vent Position	OFF	UP, LOW, CUStOM
CnF49	OEM Reset Option	OFF	0-off,1-std, 2-spec,3-cust
CnF50	Enhanced Bulb Mode Interface	0-out	1-in
CnF51	Timed Defrost Disable	0-out	1-in
CnF52	Oil Return Algorithm	0-out	1-in
CnF53	Water Cool Oil Return Logic	0-out	1-in
CnF57 *	PWM Compressor Control	0-out	1-in, **3 = DLV/DUV**
CnF58 *	Condenser Motor Type	0-1Phase C	1-3Phase C
CnF59	Electronic Evaporator Expansion Valve	0-none	1-EC, **2-KE**, 3- NA
CnF61	ACT ASC Control Enable	0-out	1-in
CnF62	Extended Temperature Control Enable	0-out	1-in
CnF63	QUEST Pre-trip / TripWise Default State	0-on	1-off
CnF64	Enable Fan Pulsing Logic	0-in	1-out
CnF66	High Speed Evaporator Fan Option	0-off	1-on

Note: Configuration numbers not listed are not used in this application. These items may appear when loading T-365 3-20 configuration software to the controller but changes will not be recognized by the controller programming.

Table 4–2 Controller Configuration Variables (Continued)

Config	Title	Default	Option
CnF67	Air Heaters	0-out	1-in
CnF68	Enable Default Pulsing Temperature	0-out	1-in
CnF70	Enable XtendFRESH Logic	0-out	1-in
CnF71	XtendFRESH Pretrip / TripWise Default State	OFF	On
CnF72	Enhance Economy Mode	OFF	On
CnF73	Custom Defrost Mode	0-out	1-in
CnF74	TripWise Pre-trip / TripWise Default State	0-off	TripWise
Note: Configuration numbers not listed are not used in this application. These items may appear when loading T-365 3-20 configuration software to the controller but changes will not be recognized by the controller programming.			

4.10 Controller Function Codes

Table 4–3 Controller Function Codes

Code	Title	Description
NOTICE **If the function is not applicable, the display will read "-----"**		
Display Only Functions - Cd01 through Cd26 are display only functions.		
Cd01	Capacity Modulation (%)	Displays the DUV percent closed. The right display reads 100% when the valve is fully closed. The valve will usually be at 10% on start up of the unit except in very high ambient temperatures.
Cd03	Compressor Motor Current	The current sensor measures current draw in lines L1 & L2 by all of the high voltage components. It also measures current draw in compressor motor leg T3. The compressor leg T3 current is displayed.
Cd04	Line Current, Phase A	The current sensor measures current on two legs. The third unmeasured leg is calculated based on a current algorithm. The current measured is used for control and diagnostic purposes. For control processing, the highest of the Phase A and B current values is used for current limiting purposes. For diagnostic processing, the current draws are used to monitor component energization. Whenever a heater or a motor is turned ON or OFF, the current draw increase/reduction for that activity is measured. The current draw is then tested to determine if it falls within the expected range of values for the component. Failure of this test will result in a Pre-trip failure or a control alarm indication.
Cd05	Line Current, Phase B	
Cd06	Line Current, Phase C	
Cd07	Main Power Voltage	The main supply voltage is displayed.
Cd08	Main Power Frequency	The value of the main power frequency is displayed in Hertz. The frequency displayed will be halved if either fuse F1 or F2 is bad (alarm code AL21).
Cd09	Ambient Temperature	The ambient sensor reading is displayed.
Cd10	Compressor Suction Temperature / Evaporator Temperature	Evaporator temperature sensor reading is shown on the right display.
Cd11	Compressor Dome Temperature / Discharge Temperature	Compressor discharge temperature sensor reading, using compressor dome temperature, is displayed.

Table 4–3 Controller Function Codes (Continued)

Code	Title	Description
Cd12	Compressor Suction Port Pressure	Reading for evaporator pressure transducer (EPT) is shown on the left display; Press ENTER at Cd12 to show reading for compressor suction port pressure on right display.
Cd14	Compressor Discharge Pressure	Compressor discharges pressure transducer reading is displayed.
Cd15	Digital Unloader Valve	The status of the valve is displayed (Open - Closed).
Cd16	Compressor Motor Hour Meter/Unit Run Time Hour Meter	This code displays the compressor motor hours. User can view unit run time by pressing the ENTER key while in Cd16. Total hours are recorded in increments of 10 hours (i.e., 3000 hours is displayed as 300). The Compressor Motor Hour Meter display can be reset to 0 by pressing and holding the ENTER key for 5 seconds. The Unit Run Time Hour Meter cannot be reset.
Cd17	Relative Humidity %	Humidity sensor reading is displayed. This code displays the relative humidity, as a percent value.
Cd18	Software Revision #	The software revision number is displayed.
Cd19	Battery Check	This code checks the Controller/DataCORDER battery pack. While the test is running, “btest” will flash on the right display, followed by the result. “PASS” will be displayed for battery voltages greater than 7.0 volts. “FAIL” will be displayed for battery voltages between 4.5 and 7.0 volts, and “-----” will be displayed for battery voltages less than 4.5 volts. After the result is displayed for four seconds, “btest” will again be displayed, and the user may continue to scroll through the various codes.
Cd20	Config/Model #	This code indicates the dash number of the model for which the Controller is configured (i.e., if the unit is a 69NT40-551-100, the display will show “51100”). To display controller configuration database information, press ENTER. Values in “CFYYMMDD” format are displayed if the controller was configured with a configuration card or with a valid OEM serial port configuration update; YYMMDD represents the publication date of the model configuration database.
Cd21	Capacity Mode	The mode of operation is displayed (Unloaded - Standard - Economized).
Cd22	Compressor State	The status of the compressor is displayed (OFF, On).
Cd23	Evaporator Fan	Displays the current evaporator fan state (OFF, LOW, HIGH).
Cd25	Compressor Run Time Remaining Until Defrost	This code displays the time remaining until the unit goes into defrost (in tenths of an hour). This value is based on the actual accumulated compressor running time.
Cd26	Defrost Temperature Sensor Reading	Defrost temperature sensor reading is displayed.
Configurable Functions - Cd27 through Cd37 are user-selectable functions. The operator can change the value of these functions to meet the operational needs of the container.		

Table 4–3 Controller Function Codes (Continued)

Code	Title	Description
Cd27	Defrost Interval (Hours or Automatic)	This is the desired period of time between defrost cycles. Factory default is “AUTO”. Refer to **Section 4.3.20** for information on Defrost Interval. CnF11 determines whether the operator will be allowed to chose “OFF” as a defrost interval option. CnF64 determines whether the operator will be allowed to choose “PuLS” as a defrost interval option. For units operating with “PuLS” selected, defrost interval is determined by the unit temperature setpoint and the Evaporator Fan Pulsing Temperature Setting (Cd60). When the unit temperature setpoint is equal to or less than the Evaporator Fan Pulsing Temperature Setting, the defrost interval is set to 6 hours. Otherwise, the defrost interval is determined using the Automatic Defrost Interval Determination logic. In either case, “PuLS” remains displayed in this function select code. After a new Defrost Interval is selected, the previously selected Interval is used until the next defrost termination, the next time the DTT contacts are OPEN, or the next time power to the control is interrupted. If the previous value or the new value is “OFF”, the newly selected value will be used immediately. If any Auto Pretrip sequence is initiated, Cd27 will be set to ’AUTO’ unless CnF49 (OEM Reset) is set to “Custom” AND CnF64 (Evaporator Fan Pulsing Logic) configuration variable is set to IN, in which case Cd27 will be set to “PuLS”.
Cd28	Temperature Units (Degrees C or Degrees F)	This code determines the temperature units (C or F) that will be used for all temperature displays. The user selects C or F by selecting function code Cd28 and pushing the ENTER key. The factory default value is Celsius units. This function code will display “-----“ if CnF34 is set to F.
Cd29	Failure Action (Mode)	If all of the control sensors are out of range (alarm code AL26) or there is a probe circuit calibration failure (alarm code AL27), the unit will enter the shutdown state defined by this setting. The user selects one of four possible actions as follows: A - Full Cooling (Compressor is on, economized operation.) b - Partial Cooling (Compressor is on, standard operation.) C - Evaporator Fan Only (Evaporator fans on high speed, not applicable with frozen set points.) d - Full System Shutdown - Factory Default (Shut down every component in the unit.)
Cd30	IIn-Range Tolerance	The in-range tolerance will determine the temperature band around the set point which will be designated as in-range. For normal temperature control, control temperature is considered in range if it is within setpoint in-range Tolerance. There are four possible values: 1 = +/- 0.5°C (+/-0.9°F) 2 = +/- 1.0°C (+/-1.8°°F) 3 = +/- 1.5°C (+/-2.7°F) 4 = +/- 2.0°C (+/-3.6°F) - Factory Default If the control temperature is in-range, the green IN-RANGE light will be illuminated. In-range tolerance shall be set to +/- 2.0°C upon activation of dehumidification or bulb mode (Cd33, Cd35, Cd48). When CCPC is actively controlling, in-range tolerance is not considered. “-----“ will be displayed whenever Dehumidification or Bulb mode is enabled or when CCPC with six hour re-activation is actively controlling. “-----“ will be displayed whenever Frozen Economy Mode is operating.

Table 4–3 Controller Function Codes (Continued)

Code	Title	Description
Cd31	Stagger Start Offset Time (Seconds)	The stagger start offset time is the amount of time that the unit will delay at start-up, thus allowing multiple units to stagger their control initiation when all units are powered up together. The eight possible offset values are 0 (Factory Default), 3, 6, 9, 12, 15, 18 or 21 seconds.
Cd32	System Current Limit (Amperes)	The current limit is the maximum current draw allowed on any phase at any time. Limiting the unit's current reduces the load on the main power supply. When desirable, the limit can be lowered. Note, however, that capacity is also reduced. The five values for 460 VAC operation are: 15, 17, 19, 21, or 23 amperes. The factory default setting is 21 amperes.
Cd33	Humidity Setpoint	This is the value in percent to which the system will dehumidify or humidify. There are configuration variables that determine whether dehumidification/humidification capabilities are installed. In the test mode, the setpoint will be temporarily set to 1%, allowing the test of dehumidification. After 5 minutes, the normal setpoint is restored. If unit is configured for HUMIDIFICATION MODE then selection of a setpoint greater than 75% will activate humidification, and a setpoint less than or equal to 75% will activate dehumidification. If the unit is configured for dehumidification only, then the entire setpoint range will apply to dehumidification. If Pretrip is initiated, this value will be set to "OFF" automatically. (Replaced by Cd48 interface if CnF50 Enhanced Bulb Mode Interface is active.)
Cd34	Economy Mode (On-Off)	The current state of the economy mode option, "-----", On, or Off. CnF22 determines whether economy mode offered. Economy mode is a user selectable mode of operation provided for power saving purposes.
Cd35	Bulb Mode	The current state of the bulb mode option, "-----", nOr, or bULb. (Replaced by Cd48 if CnF50, Enhanced Bulb Mode, is active.) Bulb mode is an extension of dehumidification control (Cd33). If dehumidification (CnF04) is set to "Off," Cd35 will display "Nor" and the user will be unable to change it. CnF28 determines whether the bulb mode selection is offered. After a dehumidification set point has been selected and entered for code Cd33, the user may then change Cd35 to "bulb." After Bulb Mode has been selected and entered, the user may then utilize function codes Cd36 and Cd37 to make the desired changes.
Cd36	Evaporator Fan Speed Select	This is the desired evaporator fan speed for use during the bulb Dehumidification and Humidification mode option. (Replaced by Cd48 if CnF50, Enhanced Bulb Mode, is active.) This code is enabled only if in the dehumidification mode (Cd33) and bulb mode (Cd35) has been set to "bulb." If these conditions are not met, "alt" will be displayed (indicating that the evaporator fans will alternate their speed) and the display cannot be changed. If a dehumidification set point has been selected along with bulb mode then "alt" may be selected for alternating speed, "Lo" for low speed evaporator fan only, or "Hi" for high speed evaporator fan only. If a setting other than "alt" has been selected and bulb mode is deactivated in any manner, then selection reverts back to "alt."
Cd37	Variable DTT Setting (Bulb Mode)	This is the variable defrost termination thermostat setting to be used with the optional bulb mode functionality. This item is only displayed if the bulb mode option is configured on. (Replaced by Cd48 interface if CnF50 Enhanced Bulb Mode Interface is active.)
Display Only Functions - Cd38 through Cd40 are display only functions.		

Table 4–3 Controller Function Codes (Continued)

Code	Title	Description
Cd38	Secondary Supply Temperature Sensor	Cd38 will display the current supply recorder sensor (SRS) reading for units configured for four probes. If the unit is configured with a DataCORDER, Cd38 will display “-----.” If the DataCORDER suffers a failure, (AL55) Cd38 will display the supply recorder sensor reading.
Cd39	Secondary Return Temperature Sensor	Cd39 will display the current return recorder sensor (RRS) reading for units configured for four probes. If the unit is configured with a DataCORDER, Cd39 will display “-----.” If the DataCORDER suffers a failure, (AL55) Cd39 will display the return recorder sensor reading.
Cd40	Container Identification Number	If a valid container id exists, the default display for Cd40 will be “cd40_XXXXX” where “XXXXX” is the 5th character through the 9th character of the container id. Pressing the Enter key on Cd40 will display “id_YYYYYYY” where “YYYYYYY” is the 5th character to the 11th character of the container id. If no valid container id exists or the container id is blank, the default display will have Cd40 on the left display and the right display will alternate between “_nEEd” and “___id”. Pressing the enter key while on Cd40 in the state will prompt the Set Id Interface. On start up if the container id is not valid, Cd40 will be brought up on the display for the first minute of power up. This can be left by either entering a container id or leaving the code select normally. Cd40 is configured at commissioning to read a valid container identification number. The reading will not display alpha characters; only the numeric portion of the number will display.
Cd41	Valve Override	SERVICE FUNCTION: This code is used for troubleshooting, and allows manual positioning of the economizer solenoid valve, electronic expansion valve, and digital unloader valve. Provides readings such as: Percent Capacity, EEV, Capacity Mode, LIV and DUV. Refer to paragraph 6.21 for operating instructions.
NOTICE **For Units configured for eAutoFresh Cd43 and Cd44 using the following:**		
Configurable Functions - Cd43 is a user-selectable function. The operator can change the value of this function to meet the operational needs of the container.		
Cd43	eAutoFresh Mode	Cd43 is a user selectable mode of operation that allows the opening and closing of a mechanical air vent door via a stepper motor. These selection modes are as follows: OFF - Air makeup vent will remain closed. USER - Allows for manual selection of the setting. DELAY -The opening of the door is based on selected time, return temperature and flow rate (percent opened). gASLM - The opening is based percent open and CO_2 and O_2 selectable limits (LM). This selection is only active if the unit has a CO_2 sensor. TEST / CAL (CO_2 sensor option units only) - The door will fully open and close to allow the user to inspect its operation. If CAL is selected, the controller will zero calibrate the CO_2 sensor input. If the unit is not configured with AutoFresh, the Cd43 will display “----” Refer to **Section 5.4** for description of operational parameters.

Table 4–3 Controller Function Codes (Continued)

Code	Title	Description
Cd43	XtendFresh Mode	Cd43 is a user selectable mode of operation that allows the opening and closing of an air vent door and CO_2 scrubber unit. These selection modes are as follows: OFF - Vent will remain closed and scrubber will remain off. XTEND - The opening of the vent and activation of the scrubber will be controlled based upon CO_2 and O_2 concentration values and selectable set points. This selection is only active if the unit has a CO_2 or O_2 sensor. TEST - Selecting “TEST” will open/close the vent and activate/deactivate the scrubber to allow the user to confirm operation. If “CAL” is selected, the controller will provide options for zero calibration of the CO_2 sensor input and span calibration of the O_2 sensor input. If the unit is not configured for XtendFRESH or eAutoFresh, the Cd43 will display “−−−−”. Refer to section 4.6.1 for description of operational parameters.
Display Only Function - Cd44 is a display only function.		
Cd44	eAutoFresh Values / CO_2 Sensor Status	Code Cd44 displays the eAutoFresh CO_2 and O_2 values (CO_2 and O_2) and CO_2 and O2 limits (CO_2 LIM and O_2 LIM), respectively. This function code will be dashed out if not configured for eAutoFresh. This function code will be dashed if CO_2 sensor is not detected, and a sensor is not expected (didn’t have one previously). This function code will display “ChECK” if a CO_2 sensor has not been auto-detected at the most recent power-up and was detected at a previous power-up. If “ChECK” is displayed and the ENTER key is pressed, “SEnSr” is displayed with the choices of “YES” and “no”: “YES” – sensor should be remembered as detected (present) “no” – sensor should not be remembered as being detected (not present)
Cd44	XtendFRESH Values / CO_2 Sensor Status	If a user presses Enter, the CO_2 value will be displayed. Pressing Enter again will display the O_2 value. This function code will be dashed out if not configured for XtendFRESH or eAuto-Fresh. This function code will be dashed if CO_2 and O_2 sensors are not detected, and sensors are not expected.
Configurable Functions - Cd45 through Cd48 are user-selectable functions. The operator can change the value of these functions to meet the operational needs of the container.		
Cd45	Vent Position Sensor (VPS) Position	Values: 0 to 240 for UPPER / 0 to 225 for LOWER This function code will be dashed out if not configured for VPS. When configured for VPS, Cd45 displays the current vent position in units of 5 CMH (units displayed as “CM”) or CFM (units displayed as “CF”) depending on the selection of Cd46 (Airflow display units), Cd28 (Metric/Imperial) or the pressing of the deg C/F key. Cd45 will display whenever the control detects movement via the sensor unless AL50 is active. Cd45 will display for 30 seconds, then time out and return to the normal display mode.

Cd46	Airflow Display Units	Selects the airflow units to be displayed by Cd45 if configured for Vent Position Sensor or displayed by “USER/FLO” under Cd43 if configured for Autoslide.
		CF= Cubic Feet per Minute
		CM=Cubic Meters per Hour
		bOth=Displays CF or CM depending on the setting of Cd28 (Metric/Imperial) or the pressing of the degree C/F key.

Table 4–3 Controller Function Codes (Continued)

Code	Title	Description
Cd47	Variable Economy Temperature Setting	Used when Economy Mode (CnF22) is set to 3-cust. Display will show "----" when the unit is not configured for Economy Mode. When the unit has a perishable setpoint and Economy Mode is active, at the start of each cooling or heating cycle, high speed evaporator fans will run for 3 minutes. After three minutes, the evaporator fans will be switched to low speed any time that the supply temperature is within +/- 0.25C of the setpoint and the return temperature is less than or equal to the supply temperature + the user selected Cd47 (values are 0.5 C - 4.0 C, default is 3.0 C).
Cd48	Dehumidification / Bulb Cargo Mode Parameter Selection	Initially Cd48 will display current dehumidification-mode; bUlb - bulb cargo mode, dEhUM - normal dehumidification, or OFF - off. This display is steady. Pressing ENTER key will take the interface down into a hierarchy of parameter selection menus (mode, setpoint, evaporator speed, DTT setting). Pressing ENTER key in any parameter selection menu commits to selection of the currently displayed parameter and causes the interface to descend into the next parameter selection menu. All parameter selection menus alternate between a blank display and the current selection in the right hand display. Pressing CODE SELECT key in a selection menu cancels the current selection activity and ascends back up to the next higher selection menu (or to Cd48 display mode if that is the next higher). If the operator does not press any key for five seconds the interface reverts to normal system display and the current selection menu is canceled, but any previously committed changes are retained. Available parameters and parameter ranges are a function of configuration options and previously selected parameters as indicated above. Whenever any pretrip test is initiated, dehumidification-mode goes to OFF. Whenever dehumidification-mode goes to OFF: • Dehumidification control setpoint goes to 0% RH internally but will then initialize to 95% RH when dehumidification-mode leaves OFF. • Evaporator speed select goes to Alt for units without PWM Compressor Control (Cnf57 = Out), Evaporator speed select goes to Hi for units with PWM Compressor Control (Cnf57 = In). • DTT setting goes to 25.6°C or 18.0°C, depending on Cnf41. Whenever dehumidification-mode is set to bUlb, DTT setting goes to 18.0°C if it had been set higher. Whenever dehumidification-mode is set to dEhUM, DTT setting goes to 25.6°C or 18.0°C, depending on Cnf41. For units without PWM Compressor Control (Cnf57 = Out): • Whenever dehumidification control setpoint is set below 65% RH evaporator speed select goes to LO if it had been set to Hi. • Whenever dehumidification control setpoint is set above 64% RH evaporator speed select goes to Alt if it had been set to LO. For units with PWM Compressor Control (Cnf57 = In): • - Whenever dehumidification control set point is set below 60% RH, the evaporator fan speed is set to LO, the user has the ability to set the evaporator fan speed to Hi via the keypad. • - Whenever dehumidification control set point is set equal to or above 60% RH, the evaporator fan speed is set to Hi, the user has the ability to set the evaporator fan speed to LO via the keypad.
Display Only Function - Cd49 is a display only function.		

Table 4–3 Controller Function Codes (Continued)

Code	Title	Description
Cd49	Days Since Last Successful Pre-trip	Displays the number of days since last successful pretrip sequence. Press ENTER to view the number of days since the last successful pretrip for Auto1, Auto2, and Auto2 in sequence. Press CODE SELECT to step back through the list and ultimately to exit the Cd49 display.
Configurable Functions - Cd50 through Cd53 are user-selectable functions. The operator can change the value of these functions to meet the operational needs of the container.		
Cd50	Quest Enable / Disable	”OFF” = disabled. ”On” = enabled. ”SEtPt” = suspended by setpoint too low. ”CAHUM” = suspended by CA or humidity control. ”ACt” = suspended by ACT active. ”FAIL” = all return temperature probe failure for CCPC. ”PrtrP” = pretrip active. ”C LIM” = suspended by cool limit logic. ”PULL” = pulldown active. “ALArM ” = suspended by shutdown alarm Press enter, arrow keys, and then enter to select ”OFF” or ”On”. If ”On” is selected, CCPC operation may be suspended as indicated by one of the suspension codes listed above. If CCPC is not ”OFF” and is not suspended, ”On” will be displayed.
Cd51	Automatic Cold Treatment (ACT) Mode Parameter Selection	ACT-mode: Cd51 increments of (1 day)_(1hr), Display: default “0_0 “ “done” mm-dd this will be display is ACT has completed “ACt” value “On” “OFF” or “----“Display /Select: default “OFF“ “trEAt” value C / F on 0.1 degree increments Display/Select: default “0.0C“ “DAyS” value “0 – 99” increments of 1 Display/Select: default “0“ “ProbE” value Probe positions ex ’1 2 _ 4’ ’1 _ 3 _’ Display: default “---- “ “SPnEW” value C / F on 0.1 increments Display/Select: default “10.0C “ Initially Cd51 will display current countdown timer increments of (1 day)_(1hr), default“0_0. Pressing ENTER key will take the interface down into a hierarchy of parameter selection menus (act, treat, days, probe and spnew setting). Pressing ENTER key in any of the parameter selection menus commits to selection of the currently displayed parameter and causes the interface to descend into the next parameter selection menu. All parameter selection menus alternate between a blank display and the current selection in the right hand display. Pressing CODE SELECT key in a selection menu cancels the current selection activity and ascends back up to the next higher selection menu (or to Cd51 display mode if that is the next higher).

Table 4–3 Controller Function Codes (Continued)

Code	Title	Description
Cd51	Automatic Cold Treatment (ACT) Mode Parameter Selection	If the operator does not press any key for five seconds the interface reverts to normal system display and the current selection menu is cancelled, but any previously committed changes are retained. Available parameters and parameter ranges are a function of configuration options and previously selected parameters as indicated above. Parameter with the exception of “Act” may not be altered if Cd51 is re-entered if “Act” is “On”. When ACT has completed including reaching the new setpoint “done” on the left display and the MONTH DAY of completion on the right display will be displayed as the second entry in the menu. Turning ACT off clears this entry. This action also resets Cd51 to initial time remaining. ACT must then be turned on to view or modify the additional parameters. Whenever any auto Pre-trip test or Trip Start is initiated, ACT mode goes to OFF.
Cd53	Automatic Setpoint Change (ASC) Mode Parameter Selection	ASC-mode: Cd53 increments of (1 day)_(1hr), Display: default “0_0 “ “done” mm-dd this will be display is ASC has completed “ASC” value “On” “OFF” Display /Select: default “OFF“ “nSC” value “1 - 6“ (This is the value “n” for the subsequent entries). “SP (n-1)” value C / F on 0.1 degree increments Display/Select: default “10.0C“ “DAY (n-1)” value “1 – 99” increments of 1 Display/Select: default “1“ “SP (n)” value C / F on 0.1 degree increments Display/Select: default “10.0C Initially Cd53 will display current count down timer increments of (1 day)_(1hr), default “0_0. Pressing ENTER key will take the interface down into a hierarchy of parameter selection menus, (mode, act, treat, days, probe and spnew setting). Pressing ENTER key in any of the parameter selection menus selects the currently displayed parameter and causes the interface to descend into the next parameter selection menu. All parameter selection menus alternate between a blank display and the current selection in the right hand display. Pressing CODE SELECT key in a selection menu cancels the current selection activity and ascends back up to the next higher selection menu (or to Cd53 display mode if that is the next higher).
		If the operator does not press any key for five seconds the interface reverts to normal system display and the current selection menu is cancelled, but any previously committed changes are retained. Available parameters and parameter ranges are a function of configuration options and previously selected parameters as indicated above. Parameter with the exception of “ASC” may not be altered if Cd53 is re-entered if “ASC” is “On”. When ASC has completed including reaching the last setpoint “done” on the left display and the MONTH DAY of completion on the right display will be displayed as the second entry in the menu. Turning ASC off clears this entry. This action also resets Cd53 to initial time remaining. ASC must then be turned on to view or modify the additional parameters. Whenever any auto pretrip test or Trip Start is initiated, ASC mode goes to OFF.
Display Only Functions - Cd54 through Cd58 are display only functions.		

Table 4–3 Controller Function Codes (Continued)

Code	Title	Description
Cd54	Suction Port Superheat / Electronic Expansion Valve Status	Reading for evaporator superheat (suction temperature minus suction saturation temperature as calculated from suction pressure) is shown on the right display. Press ENTER at Cd54 to show reading for EEV position (in %) on left display.
Cd55	Discharge Superheat	Cd55 will display discharge superheat (discharge temperature minus discharge saturation temperature as calculated from discharge pressure) values in C /F as calculated by the discharge temperature minus the discharge saturation temperature as calculated from discharge pressure. “-----” will be displayed if selection is not valid.
Cd58	Water Pressure Switch / Condenser Fan Switch State or Override Logic State	Cd58 will display “CLOSE” if the WPS or CFS switch contacts are closed or if these options are not installed. “OPEn” is displayed when the WPS or CFS switch contacts are open. When the WPS/CFS Override Logic is “TRUE”, the right display will flash on all units. **NOTE:** 1. This CLOSE/OPEn state displayed in this Code Select function only applies to units that have the ability to detect the state of a WPS/CFS. This function should not be relied upon to display the condition of the switch on units that don’t have a WPS/CFS switch connected to ECG2 exclusively. 2. The right display will flash if the WPS/CFS Override Logic is TRUE on all units. This is always the case, whether the unit has a WPS or CFS installed or not. 3. The ability of the WPS/CFS Override Logic to control the condenser fan is limited. It is not possible for this logic to control the fan on units that have the WPS or CFS wired in series with the fan contactor. Units wired in this configuration can indicate that the WPS/CFS Override Logic is active by flashing the right display, however, the wiring will not allow for control of the condenser fan.
Configurable Functions - Cd59 through Cd61 are user-selectable functions. The operator can change the value of these functions to meet the operational needs of the container.		
Cd59	Pump Down Logic	Cd59 allows operation of the pump down logic control. The display will flash between “STArT PdN” and “PrESS EnTEr”. Upon entering Cd59 the operator will be required to acknowledge that they want to initiate the pump down control. The display will flash between “STArT P dN” and “PrESS EnTEr”. Once the decision to continue is confirmed pump down logic will begin, and will take complete control of the unit until pump down either succeeds or fails. This operation can not be halted once it begins without power cycling the unit. After pump down logic has been initiated, the operator will be notified to close the Liquid Line Valve, the display will flash between “CLOSE LLV” and “PrESS EnTEr”. Once complete the display will read “P dN” to the left, and the current suction pressure to the right. If the automatic pump down logic succeeds within 20 minutes, the unit will turn itself off, and the display will notify the operator that pump down is complete by flashing between “P dN DOnE” and “SHUT OFF”. The operator must then shut off the unit. If the automatic pump down logic does not complete within 20 minutes, the unit will drop out of Cd59 and return to its previous control condition.

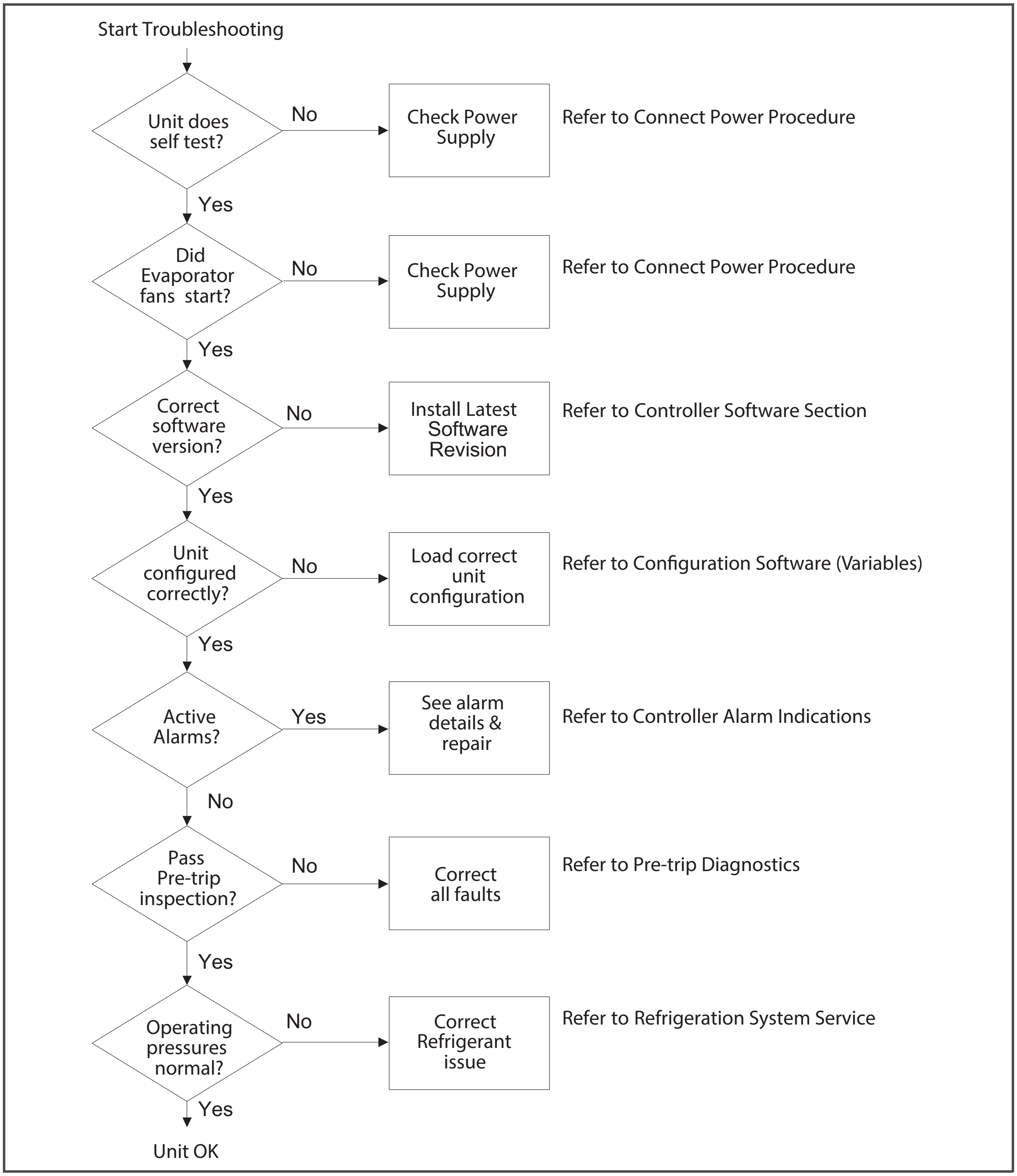
Table 4–3 Controller Function Codes (Continued)

Code	Title	Description
Cd60	Evaporator Fan Pulsing Temperature Setting	Cd60 contains a selectable temperature range used to determine the engagement point of the Evaporator Fan Pulsing logic. The default setting is -18.1°C. The user may change the temperature by pressing ENTER, then scrolling to the desired temperature using either Arrow key. Press ENTER to accept the change. The temperature setting will be retained until either a Pre-trip or Trip Start is initiated at which time the temperature will set to the default setting. “-----” will be displayed if CnF68 is configured OUT.
Cd62	High Speed Evaporator Fan Setting	Cd62 is used to force evaporator fan speed to high while temperature control is being performed in the perishable setpoint range. When set to “On”, evaporator fans operate in high speed regardless of any other active option that can control evaporator fan speed. Following a power cycle, the state of the function select code is retained at its state prior to the power cycle. If “On”, this function select code will be set to “OFF” when any trip start occurs or any pretrip test is initiated. Event 99 shall be logged when ever CD62 is Turned ON OR if CD62 state is ON at Mid night. Event 100 shall be logged when ever CD62 is Turned OFF OR if CD62 is dashed out from ON state to OFF state due to setpoint change to frozen range. “-----” will be displayed if setpoint is in frozen range OR if Cnf66 is configured OFF.
Cd63	FuelWise	Cd63 is used to enable Enhanced Economy Mode (EEM). Following a power cycle, the state of the function select code is retained at its state prior to the power cycle if CNF72 = Default ON else if Default OFF this will be set to OFF . If “On”, this function select code will be set to “OFF” when any trip start occurs or any pretrip test is initiated. Event 120 shall be logged when ever CD63 is Turned ON OR if CD63 state is ON at Mid night. “-----” will be displayed if Cnf72 is configured OFF.
Cd64	Alternative Compressor Selection PrimeLine w/ Edge Technology	Cd64 is used to allow the use of a standard PrimeLine compressor in a PrimeLine with edge technology unit. When “Std” is selected The Minimum allowable capacity ratio will be set to 10%, Standard PrimeLine current limiting logic will be utilized, the original PrimeLine P6-7 test will be used during PreTrip, and the DLV will remain de-energized. “-----” will be displayed if Cnf57 is configured “0” or “1”.
Cd65	TripWise	If the function is off, display "OFF". If the function is on, display "ON". “-----” will be displayed if the TripWise option is not active for the current configuration. Press the ENTER key. The existing entry will flash. Use the Arrow keys to alternate between OFF and ON. Press ENTER again to set the Expiration Interval. Left display: “dAyS” Right display: Expiration Interval 2 through 365 in one day increments. Default value is 30.
Cd66	Instantaneous Power (kW)	Real power in kW currently being used by the system. Value is “-----“,“ nnn.n Display “-----“ if not configured else nnn.n
Cd67	Total Power (kW-hr)	Energy used by the system, in kW-hrs, since last Trip Start. Value is “-----“,“ nnnnn Display “-----“ if not configured else nnnnn

Table 4–3 Controller Function Codes (Continued)

Code	Title	Description
Cd70	Temp Setpoint Lock	Cd70 locks out setpoint selection, requiring the user to manually turn the lock off, prior to making a setpoint change. If the setpoint lock is “ON”, and the user attempts to enter a new setpoint, a message “SPLK” (Setpoint Lock) is in the left display and “ON” in the right display for five seconds. Press the ENTER key. “SPLK” will display along with the current setting of “ON” or “OFF”. Use the Arrow keys to change the selection - the new selection will then flash for five seconds. Press the ENTER key to confirm the new selection. Default setting is “OFF”. Unit will default to “OFF” with the selection of PTI or a TripWise on the unit.

Figure 4.12 Alarm Troubleshooting Sequence


Start Troubleshooting
Unit does self test?
No
Check Power Supply
Refer to Connect Power Procedure
Yes
Did Evaporator fans start?
No
Check Power Supply
Refer to Connect Power Procedure
Yes
Correct software version?
No
Install Latest Software Revision
Refer to Controller Software Section
Yes
Unit configured correctly?
No
Load correct unit configuration
Refer to Configuration Software (Variables)
Yes
Active Alarms?
Yes
See alarm details & repair
Refer to Controller Alarm Indications
No
Pass Pre-trip inspection?
No
Correct all faults
Refer to Pre-trip Diagnostics
Yes
Operating pressures normal?
No
Correct Refrigerant issue
Refer to Refrigeration System Service
Yes
Unit OK

4.11 Controller Alarm Indications

AL03	**Loss of Superheat Control**	
Cause:	Superheat has remained below 1.66°C (3°F) degrees for five minutes continuously while compressor running. Compressor drawing more than 2.0 amps, compressor pressure ratio is greater than 1.8, and Electronic Expansion Valve (EEV) is at 0% open.	
	Component	Electronic Expansion Valve (EEV)
	Troubleshooting	Check the operation of the EEV using Cd41.
	Corrective Action	Replace EEV if defective.
	Component	Evaporator Temperature Sensor(s) ETS & ETS1.
	Troubleshooting	Verify accuracy of temperature sensors, refer to Sensor Checkout Procedure **Section 7.26.2**.
	Corrective Action	Replace ETS or ETS1 if defective.
	Component	Evaporator Fans
	Troubleshooting	Confirm fans operating properly
	Corrective Action	Replace fan(s) if defective, refer to EVAPORATOR FAN MOTOR ASSEMBLY **Section 7.14.1**.

AL05	**Manual Defrost Switch Failure**	
Cause:	Controller has detected continuous Manual Defrost Switch activity for five minutes or more.	
	Component	Keypad Power cycle the unit.
	Troubleshooting	Resetting the unit may correct problem, monitor the unit.
	Corrective Action	If the alarm reappears after 5 minutes replace the keypad.

AL06	**Keypad or Keypad Harness Fail**	
Cause:	Controller has detected one of the keypad keys is continuously activity.	
	Component	Keypad or Harness
	Troubleshooting	Power cycle the unit. Resetting the unit may correct problem, monitor the unit.
	Corrective Action	If the alarm reappears replace the keypad and harness.

AL07	**Fresh Air Vent Open**	
Cause:	For units equipped with XtendFRESH and a Vent Position Sensor, the controller will monitor the manual fresh air opening at a pre-determined time. If during this time the fresh air vent is open and XtendFRESH is active, an alarm will be generated. If alarm is active, the controller monitors the manual fresh air once per hour. Upon clearing the alarm, the controller goes back to monitoring at the pre-determined time.	
	Component	Vent Position Sensor (VPS)
	Troubleshooting	Manually reposition vent to 0% and confirm using Cd45. If Cd45 is not reading 0%, perform a calibration of the panel. See Vent Position Sensor Service **Section 7.29**.
	Corrective Action	If unable to obtain a zero reading, replace the defective VPS. If unit is loaded, ensure vent is closed. Note and replace VPS on next PTI. The alarm will not affect the XtendFRESH system from operating.

AL08	**High Compressor Pressure Ratio**	
Cause:	Controller detects discharge pressure to suction pressure ratio is too high. The controller will attempt to correct the situation by restarting the compressor.	
	Component	Discharge Pressure Transducer (DPT)
	Troubleshooting	Confirm accurate DPT pressure readings, refer to MANIFOLD GAUGE SET **Section 7.2**.
	Corrective Action	Replace DPT if defective.

AL09	**O2 Sensor Failure**	
Cause:	Triggered anytime the O_2 sensor reading is outside of the normal operation range, after an initial signal was detected.	
	Component	O_2 Sensor, O_2 Amplifier, Sensor Switch Module (if equipped)
	Troubleshooting	Check Cd44 and scroll down to 02V. The O_2 sensor output will be displayed in millivolts (130mV to 4100mV). Switch equipped: If voltage is not present at Cd44 and a sensor switch module is installed, check for O_2 voltage on the black wire connected to the sensor switch module, connecting ground of meter to TP9. If the voltage is in the 130mV to 4.1V range, directly wire the black wire to KD04. This may cause an AL07 depending on O_2 reading but XtendFRESH will operate normally. If no voltage on the black wire, proceed to next step. Check wiring (see schematic), and correct if found mis-wired. If O_2 sensor is available, remove the upper fresh air panel and evaporator motor and replace the sensor. If after replacing sensor AL09 continues, replace amplifier. If parts are not available, turn XtendFRESH option off (Cd43) and open the Manual Fresh Air Vent.

AL10	**CO2 Sensor Failure**	
Cause:	Triggered anytime the CO_2 sensor reading is outside of the normal operation range, after an initial signal was detected.	
	Component	CO_2 Sensor
	Troubleshooting	Check the voltage at MC5 to the ground pin on TP9 (1 - 4.7 vdc). Check wiring (see schematic), and correct if found mis-wired. If part is available, remove upper fresh air panel and evaporator motor; replace sensor. If no part is available, take no action and service at next PTI. XtendFRESH will continuously run the scrubber. O2 level will be controlled with the opening and closing of the fresh air vents as required.
	Corrective Action	The alarm is triggered off when voltage is within operating range.

AL14	**Phase Sequence Detect Fault**	
Cause:	Controller is unable to determine the correct phase relationship.	
	Component	N/A
	Troubleshooting	Power cycle the unit.
	Corrective Action	Resetting the unit may correct problem, monitor the unit.
	Component	Wiring
	Troubleshooting	Check unit wiring. Confirm pressure readings during start-up; suction pressure should decrease and discharge pressure should increase.
	Corrective Action	Correct wiring.
	Component	Current Sensor
	Troubleshooting	Check Cd41, right most digit: If display is 3 or 4 check compressor / sensor wiring. If display is 5 the current sensor is defective.
	Corrective Action	Replace current sensor if defective.

AL16	**Compressor Current High**	
Cause:	Compressor current draw is over the calculated maximum for 10 minutes.	
	Component	Current Sensor
	Troubleshooting	Compare Cd3 to actual measured current at wire T1-T2 or T3 going to the compressor contactor. If there is a difference, determine whether this is caused by current sensor or amp clamp tool.
	Corrective Action	Replace current sensor if defective.
	Component	Amperage is indeed too high.
	Troubleshooting	Confirm supply voltage/frequency is within specification and balanced according to Electrical Data **Section 3.3**.
	Corrective Action	Correct power supply.
	Component	Operating Conditions
	Troubleshooting	Make sure system pressures are relevant to operating conditions.
	Corrective Action	Check air flow of condenser. Check Refrigerant charge, refer to REFRIGERATION SYSTEM SERVICE **Section 7.3**
	Component	Monitor Unit
	Troubleshooting	Alarm is display only the alarm may clear itself during operation
	Corrective Action	If alarm remains active or is repetitive replace compressor at next available opportunity, refer to COMPRESSOR Service **Section 7.8**.

AL17	**Compressor Pressure Delta Fault**	
Cause:	Compressor has attempted to start in both directions and fails to generate sufficient pressure differential between SPT and DPT.	
	Component	N/A
	Troubleshooting	Controller will attempt restart every 20 minutes and deactivate the alarm if successful.
	Corrective Action	Resume normal operation.
	Component	Discharge Pressure Transducer (DPT)
	Troubleshooting	Confirm accurate DPT pressure readings, refer to MANIFOLD GAUGE SET **Section 7.2**.
	Corrective Action	Replace DPT if defective.
	Component	Suction Pressure Transducer (SPT)
	Troubleshooting	Confirm accurate SPT pressure readings, refer to MANIFOLD GAUGE SET **Section 7.2**.
	Corrective Action	Replace SPT if defective.
	Component	Monitor unit
	Troubleshooting	Alarm is display only the alarm may clear itself during operation.
	Corrective Action	If alarm remains active or is repetitive replace compressor at next available opportunity.

AL18	**Discharge Pressure High**	
Cause:	Discharge pressure is over the maximum for 10 minutes within the last hour.	
	Component	Restrictions in the refrigeration system.
	Troubleshooting	Ensure Liquid Line Service Valve is fully open.
	Corrective Action	Open Liquid Line Service Valve as needed.
	Component	Filter Drier
	Troubleshooting	Check the filter drier, if it is iced up or very cold it indicates that the filter drier needs replacement.
	Corrective Action	Replace the filter drier if needed, refer to FILTER DRIER Service **Section 7.12**.
	Component	Condenser Fan
	Troubleshooting	Check Condenser Fan for proper operation.
	Corrective Action	Correct as required.
	Component	Discharge Pressure Transducer (DPT)
	Troubleshooting	Confirm accurate DPT pressure readings, refer to MANIFOLD GAUGE SET **Section 7.2**.
	Corrective Action	Replace DPT if defective.
	Component	Non-condensables in the refrigeration system.
	Troubleshooting	With unit off allow system to stabilize to ambient temperature. Check system pressure against PT Chart for 134a, refer to **Table 7–4**.
	Corrective Action	Correct as required, refer to Refrigerant Charge **Section 7.7.1**.
	Component	Refrigerant
	Troubleshooting	Check refrigerant level.
	Corrective Action	Correct as required, refer to Refrigerant Charge **Section 7.7.1**.

AL19	**Discharge Temperature High**	
Cause:	Discharge temperature exceeds 135°C (275°F) for 10 minutes within the last hour.	
	Component	Restrictions in the refrigeration system.
	Troubleshooting	Ensure the Discharge Service Valve is fully open.
	Corrective Action	Open the Discharge Service Valve as needed.
	Troubleshooting	Check the unit for air flow restrictions.
	Corrective Action	Clean or remove any debris from coils.
	Component	Non-condensables in the refrigeration system.
	Troubleshooting	With the unit off allow system to stabilize to ambient temperature. Check system pressure against PT Chart for 134a, refer to **Table 7–4**.
	Corrective Action	Correct as required, refer to Refrigerant Charge **Table 7.7.1**.
	Component	Additional Alarms such as AL16, AL24.
	Troubleshooting	Check compressor operation.
	Corrective Action	If the alarm persists, it may indicate a failing compressor, replace the compressor, refer to COMPRESSOR Service **Section 7.8**.

AL20	**Control Contactor Fuse (F3)**	
Cause:	Control power fuse (F3A or F3B) is open.	
	Component	Check F3A, if the fuse is open:
	Troubleshooting	Check PA, PB, CH coils for short to ground, if short is found:
	Corrective Action	Replace the defective coil. Replace the fuse.
	Component	Check F3B, if the fuse is open:
	Troubleshooting	Check ESV coil resistance at TP7 to TP9, if short to ground, or if resistance is less than 4 ohms, coil is defective. Check CF, ES, EF, HR coils for short to ground, if short is found, coil is defective.
	Corrective Action	Replace the defective coil. Replace the fuse.
	Component	Check Voltage at QC1:
	Troubleshooting	If voltage is present, it indicates a defective microprocessor.
	Corrective Action	Refer to Controller Service **Section 7.25**.

AL21	**Control Circuit Fuse (F1/F2)**	
Cause:	One of the 18 VAC controller fuses (F1/F2) is open. Refer to Cd08.	
	Component	System Sensors
	Troubleshooting	Check system sensors for short to ground.
	Corrective Action	Replace defective sensor(s)
	Component	Wiring
	Troubleshooting	Check wiring for short to ground.
	Corrective Action	Repair as needed.

AL21	**Control Circuit Fuse (F1/F2)**	
	Component	Controller
	Troubleshooting	Controller may have an internal short.
	Corrective Action	Replace controller, refer to Controller Service **Section 7.25**.

AL22	**Evaporator IP**	
Cause:	Evaporator motor internal protector (IP) is open.	
	Component	Evaporator Motor
	Troubleshooting	Shut down unit, disconnect power, & check Evaporator Motor IP at plug connection pins 4 & 6.
	Corrective Action	Replace defective evaporator fan motor, refer to EVAPORATOR FAN MOTOR Service **Section 7.14**.

AL23	**Loss of Phase B**	
Cause:	Controller fails to detect current draw.	
	Component	Incoming Power
	Troubleshooting	Check incoming power source.
	Corrective Action	Correct power source as required.

AL24	**Compressor IP**	
Cause:	Compressor internal protector (IP) is open.	
	Component	Compressor
	Troubleshooting	Shut down unit disconnect power, & check resistance of compressor windings at contactor T1-T2, T2-T3.
	Corrective Action	Monitor unit, if alarm remains active or is repetitive replace the compressor at the next available opportunity, refer to COMPRESSOR Service **Section 7.8**.

AL25	**Condenser IP**	
Cause:	Condenser fan motor internal protector (IP) is open.	
	Component	Insufficient Air Flow
	Troubleshooting	Shut down unit and check condenser fan for obstructions.
	Corrective Action	Remove obstructions.
	Component	Condenser Fan Motor
	Troubleshooting	Shut down unit, disconnect power, & check Condenser Fan Motor IP at plug connection pins KB5 & KB3.
	Corrective Action	Replace defective condenser fan motor, refer to Condenser Fan Motor Assembly Service **Section 7.11**.

AL26	**All Sensors Failure: Supply / Return Probes**	
Cause:	Sensors out of range.	
	Component	All sensors detected as out of range
	Troubleshooting	Perform Pre-trip P5:
	Corrective Action	If P5 passes, no further action is required.
		If P5 fails, replace the defective sensor as determined by P5, refer to TEMPERATURE SENSOR Service **Section 7.26**.

AL27	**Analog to Digital Accuracy Failure**	
Cause:	Controller AD converter faulty.	
	Component	Controller
	Troubleshooting	Power cycle the unit. If the alarm persists, it indicates a defective microprocessor.
	Corrective Action	Replace defective microprocessor, refer to Controller Service **Section 7.25**.

AL28	**Low Suction Pressure**	
Cause:	Suction pressure too low for normal operation	
	Component	N/A
	Troubleshooting	Power cycle the unit.
	Corrective Action	Resetting the unit may correct problem, monitor the unit.
	Component	Suction Pressure Transducer (SPT)
	Troubleshooting	Confirm accurate SPT pressure readings, refer to MANIFOLD GAUGE SET **Section 7.2**
	Corrective Action	Replace SPT if defective
	Component	Discharge Pressure Transducer (DPT)
	Troubleshooting	Confirm accurate DPT pressure readings, refer to MANIFOLD GAUGE SET **Section 7.2**
	Corrective Action	Replace DPT if defective

AL29	**AutoFresh Failure (eAutoFresh)**	
Cause:	Alarm 29 is triggered if CO_2 or O_2 level is outside of the limit range and the vent position is at 100% for longer than 90 minutes.	
	Component	Alarm LED will be activated and user intervention is required.
	Troubleshooting	Refer to eAutoFresh manual.
	Corrective Action	The alarm is triggered off when atmospheric conditions are within limit settings.

AL29	**Loss of Atmospheric Control (XtendFRESH)**	
Cause:	Triggered whenever the CO_2 level is above its upper limit by 1% for 60 minutes. Or, when the O_2 level is greater than 1% below its setpoint for longer than 30 minutes after the unit has been in range. The alarm is triggered off when the levels return to within the normal range.	
	Setup	Run Cd43 test mode for troubleshooting the below components. At the end of test mode, a sensor calibration will be attempted. Under loaded box conditions, the sensor values may post “No Cal” or “CAL FAIL”. Results from original calibration will be retained. If test mode times out, then hold the code select key for 3 seconds to exit test mode.
	Troubleshooting	If components do not energize, check FX1 and FX2 for power (460 VAC). If fuse is open, check heater continuity (XHT1 to ground). Must be greater than 1 mega ohm. If less than 1, disconnect the heater at XHT1 and XHT2. Replace fuse. Unit will control on fresh air solenoids.
	Component	Solenoid Air Vents.
	Troubleshooting	Visually inspect to see if the Solenoid Valves are opening air vents. If vents open, troubleshoot the next component. If vents do not open, continue with troubleshooting below. Check FX4 fuse for power (~20 volts dc). If fuse is open, check wiring and or replace solenoid if part is available. If no part is available, open manual fresh air vent.
	Component	XtendFRESH Fan(s) / XtendFRESH Scrubber Motor
	Troubleshooting	Visually inspect to see if the XtendFRESH Fan(s) are running (air blowing on left, intake on right), check current draw of motor at the XST1 (~40 to 200 milliamps / contactor load side). Troubleshoot the non-operating component. If both are running, proceed to next component. Verify XS contactor is pulling in. If not, check FX6 fuse for power (24 VAC). If not, check power at controller KB4. Check FX3 fuse for power (~20 vdc). If no power, replace fuse. If fuse opens a second time, take no further action. O_2 level will be controlled with the opening and closing of the fresh air vents. If part is available, replace either fan or scrubber motor. Fan is replaceable from the front on a loaded unit; Scrubber motor is not. If no part is available or accessible, take no action and service at next PTI. O_2 level will be controlled with the opening and closing of the fresh air vents.
	Component	Heater
	Troubleshooting	Verify XH contactor is pulling in. If not, check FX6 for power (24 VAC). If open ohm contactors XHA1 and XSA1 to ground. Replace (12 Amp) contactor. If contactor is pulling, power unit off and check heater resistance from XH1 to XH2 (450 to 500 ohms). If heater is outside of the range, disconnect heater at XHT1 and XHT2 and replace at next PTI. Unit will control on fresh air solenoids.

AL50	**Air Vent Position Sensor (VPS)**	
Cause:	VPS Sensor out of range.	
	Component	Vent Position Sensor (VPS)
	Troubleshooting	Make sure VPS is secure.
	Corrective Action	Manually tighten panel.
	Troubleshooting	If the alarm persists, replace the sensor or the assembly.
	Corrective Action	Replace VPS.

AL51	**EEPROM failure**	
Cause:	Controller Memory Failure	
	Component	Controller
	Troubleshooting	Pressing the ENTER key when “CLEAr” is displayed will result in an attempt to clear the alarm.
	Corrective Action	If action is successful (all alarms are inactive), alarm 51 will be reset.
	Troubleshooting	Power cycle the unit. If the alarm persists, it indicates defective controller memory.
	Corrective Action	Replace defective controller, refer to Controller Service **Section 7.25**

AL52	**EEPROM Alarm List Full**	
Cause:	Alarm list queue is full.	
	Component	Active Alarms
	Troubleshooting	Repair any alarms in the queue that are active. Indicated by “AA”.
	Corrective Action	Clear alarms, refer to CONTROLLER ALARMS **Section 4.6**.

AL53	**Battery Pack Failure**	
Cause:	Battery voltage low	
	Component	Battery
	Troubleshooting	If this alarm occurs on start up, allow a unit fitted with rechargeable batteries to operate for up to 24 hours to charge rechargeable batteries sufficiently. Once fully charged, the alarm will deactivate.
	Corrective Action	To clear the alarm press ENTER and ALT simultaneously at the startup of Cd19 (Battery Check). If alarm persists, replace the battery pack, refer to **Section 7.25.6** Battery Replacement.

AL54	**Primary Supply Sensor (STS)**	
Cause:	Invalid Supply Temperature Sensor (STS) reading.	
	Component	Supply Temperature Sensor (STS)
	Troubleshooting	Perform Pre-trip P5: If P5 passes, no further action is required.
	Corrective Action	If P5 fails, replace the defective sensor as determined by P5, refer to TEMPERATURE SENSOR Service **Section 7.26**.

AL56	**Primary Return Sensor (RTS)**	
Cause:	Invalid Return Temperature Sensor (RTS) reading.	
	Component	Return Temperature Sensor (RTS)
	Troubleshooting	Perform Pre-trip P5:
	Corrective Action	If P5 passes, no further action is required.
		If P5 fails, replace the defective sensor as determined by P5, refer to TEMPERATURE SENSOR Service **Section 7.26**.

AL57	**Ambient Sensor (AMBS)**	
Cause:	Invalid Ambient Temperature Sensor (AMBS) reading.	
	Component	Ambient Temperature Sensor (AMBS)
	Troubleshooting	Test the AMBS, refer to Sensor Checkout Procedure **Section 7.26.2**.
	Corrective Action	Replace AMBS if defective, refer to TEMPERATURE SENSOR Service **Section 7.26**.

AL58	**Compressor High Pressure Safety (HPS)**	
Cause:	High pressure safety switch remains open for at least one minute.	
	Component	High Pressure Switch (HPS)
	Troubleshooting	Test the HPS; refer to Checking High Pressure Switch, **Section 7.9.1**.
	Corrective Action	Replace HPS if defective, refer to Sensor Replacement, **Section 7.26**.
	Component	Refrigeration System
	Troubleshooting	Check unit for air flow restrictions.
	Corrective Action	Clean or remove any debris from coils.

AL59	**Heater Termination Thermostat (HTT)**	
Cause:	Heat Termination Thermostat (HTT) is open.	
	Component	Heat Termination Thermostat (HTT)
	Troubleshooting	Check for 24 volts at test point TP10, if no voltage at TP10 after unit has reached set point HTT is open.
	Corrective Action	Replace HTT if defective, refer to Sensor Replacement **Section 7.26**.

AL60	**Defrost Temperature Sensor (DTS)**	
Cause:	Failure of the Defrost Temperature Sensor (DTS) to open.	
	Component	Defrost Temperature Sensor (DTS)
	Troubleshooting	Test the DTS; refer to Sensor Checkout Procedure **Section 7.26.2**.
	Corrective Action	Replace the DTS if defective, refer to Sensor Replacement **Section 7.26**.

AL61	**Heater Current Draw Fault**	
Cause:	Improper current draw during heat or defrost mode.	
	Component	Heater(s)
	Troubleshooting	While in heat or defrost mode, check for proper current draw at heater contactors, refer to ELECTRICAL DATA **Section 3.3**.
	Corrective Action	Replace heater(s) if defective, refer to **Section 7.13.2** Evaporator Heater Removal and Replacement.
	Component	Contactor
	Troubleshooting	Check voltage at heater contactor on the heater side. If no voltage present:
	Corrective Action	Replace heater contactor if defective.

AL62	**O2 Out of Range**	
Cause:	This is a notification alarm and does not pose a risk to fresh produce. It is triggered when there is an indication that O_2 level is rising after reaching its setpoint (+ 1%). If O_2 level exceeds 4% above setpoint, the alarm is activated. The alarm does not activate if the unit was pre-tripped or trip started between last reaching its O_2 setpoint and exceeding the plus 4%, or if power has been turned off for eight hours. The alarm is deactivated if O_2 drops below setpoint (+ 1%) or if a pre-trip or trip start is performed.	
	Component	Scrubber Failure
	Troubleshooting	See the troubleshooting of the Scrubber Motor in the AL29 alarm.
	Component	XtendFRESH Solenoid Valves
	Troubleshooting	See the troubleshooting of the Solenoid Air Vent in the AL29 alarm.
	Component	Container Air Tightness
	Troubleshooting	Seal container where possible (access panels, rear doors, mounting hardware, etc).

AL63	**Current Limit**	
Cause:	Unit operating above current limit.	
	Component	Refrigeration System
	Troubleshooting	Check unit for air flow restrictions.
	Corrective Action	Clean or remove any debris from coils.
	Troubleshooting	Check unit for proper operation.
	Corrective Action	Repair as needed.
	Component	Power supply
	Troubleshooting	Confirm supply voltage/frequency is within specification and balanced according to ELECTRICAL DATA **Section 3.3**.
	Corrective Action	Correct power supply.
	Component	Current limit set too low.
	Troubleshooting	Check current limit setting Code Cd32.
	Corrective Action	The current limit can be raised (maximum of 23 amps) using Cd32.

AL64	**Discharge Temperature Sensor (CPDS)**	
Cause:	Discharge Temperature sensor out of range.	
	Component	Discharge temperature sensor (CPDS).
	Troubleshooting	Test the CPDS; refer to Sensor Checkout Procedure, **Section 7.26.2**.
	Corrective Action	Replace the CPDS if defective, refer to Sensor Replacement **Section 7.26**.

AL65	**Discharge Pressure Transducer (DPT)**	
Cause:	Compressor Discharge Transducer is out of range.	
	Component	Compressor Discharge Transducer (DPT)
	Troubleshooting	Confirm accurate DPT pressure readings, refer to MANIFOLD GAUGE SET **Section 7.2**.
	Corrective Action	Replace DPT if defective.

AL66	(SPT) Suction Pressure Transducer, (EPT) Evaporator Pressure Transducer	
Cause:	Suction Pressure Transducer (SPT) out of range.	
	Component	Suction Pressure Transducer (SPT)
	Troubleshooting	Confirm accurate EPT and SPT pressure readings, refer to MANIFOLD GAUGE SET **Section 7.2**. - Performing a Pre-trip 5-9 test will also check the transducers.
	Corrective Action	Replace EPT/SPT if defective.
	Troubleshooting	Monitor
	Corrective Action	If the alarm persists, it may indicate a failing compressor, refer to COMPRESSOR Service **Section 7.8**.

AL67	Humidity Sensor	
Cause:	Humidity Sensor (HS) reading out of range.	
	Component	Humidity Sensor (HS)
	Troubleshooting	Make sure the humidity sensor is properly connected in the socket.
	Corrective Action	Make sure the humidity sensor wires have not been damaged. Monitor, replace HS if alarm persists.

AL69	Evaporator Temp Sensor (ETS1)	
Cause:	Evaporator Temperature Sensor (ETS1) out of range.	
	Component	Evaporator Temperature Sensor (ETS1)
	Troubleshooting	Test the ETS1, refer to Sensor Checkout Procedure **Section 7.26.2**.
	Corrective Action	Replace Evaporator Temperature Sensor (ETS1) if defective.

AL70	Secondary Supply Sensor (SRS)	
Cause:	Secondary Supply Sensor (SRS) is out of range.	
	Component	Secondary Supply Sensor (SRS)
	Troubleshooting	Perform Pre-trip P5:
	Corrective Action	If P5 passes, no further action is required.
		If P5 fails, replace the defective sensor as determined by P5, refer to TEMPERATURE SENSOR Service **Section 7.26**.

AL71	Secondary Return Sensor (RRS)	
Cause:	Secondary Return Sensor (RRS) is out of range.	
	Component	Secondary Return Sensor (RRS)
	Troubleshooting	Perform Pre-trip P5:
	Corrective Action	If P5 passes, no further action is required.
		If P5 fails, replace the defective sensor as determined by P5, refer to TEMPERATURE SENSOR Service **Section 7.26**.

AL72	**Control Temp Out Of Range**	
Cause:	After the unit goes in-range for 30 minutes then out of range for a continuous 120 minutes.	
	Component	Refrigeration System
	Troubleshooting	Ensure unit is operating correctly.
	Corrective Action	Power cycle unit. Control Temperature is in In-range. Any Pre-trip mode, resets the timers.

AL96	**Scrubber Rotational Failure - optional feature**	
Cause:	Feedback from the Scrubber Motor to the controller is not sensed when the motor is turning.	
	Component	Scrubber Fuse
	Troubleshooting	Check to see if Scrubber Fuse is blown. Replace Fuse if necessary.
	Component	Scrubber Motor
	Troubleshooting	Run Test Mode and verify scrubber bed is turning. If back panel cannot be removed to check, verify the scrubber amperage consumption, read at XS contactor wire XSL1. If between 40 and 200mA, motor is rotating properly. If no current detected, check and replace FX3. If current spiking to 350mA for 2 seconds then dropping to 90mA, the scrubber motor is located. If scrubber motor is locked, further inspection of the scrubber bed is required. Unit will control CO_2 with the fresh air solenoid when this alarm occurs if scrubber inaccessible. If Scrubber Motor not operating, follow the troubleshooting flowchart in XtendFresh manual and take appropriate action.
	Component	Ground Interface Module (GIM)
	Troubleshooting	Once it has been verified that the scrubber motor is rotating, check the wiring connections to the GIM module. If all wires secured properly, replace the GIM module if one is available. If not, the unit will control CO_2 using the fresh air solenoids.

NOTICE

If the controller is configured for four probes without a DataCORDER, the DataCORDER alarms AL70 and AL71 will be processed as Controller alarms AL70 and AL71. Refer to Table 4–7.

ERR#	**Internal Microprocessor Failure**	
Cause:	The controller performs self-check routines. If an internal failure occurs, an “ERR” alarm will appear on the display. This is an indication the controller needs to be replaced.	
	Error	Description
	ERR 0-RAM failure	Indicates that the controller working memory has failed.
	ERR 1-Program Memory Failure	Indicates a problem with the controller program.
	ERR 2-Watchdog time-out	The controller program has entered a mode whereby the controller program has stopped executing.
	ERR 3-N/A	N/A
	ERR 4-N/A	N/A
	ERR 5-A-D failure	The controller’s Analog to Digital (A-D) converter has failed.

ERR#	**Internal Microprocessor Failure**	
	ERR 6-IO Board failure	Internal program/update failure.
	ERR 7-Controller failure	Internal version/firmware incompatible.
	ERR 8-DataCORDER failure	Internal DataCORDER memory failure.
	ERR 9-Controller failure	Internal controller memory failure.
	In the event that a failure occurs and the display cannot be updated, the status LED will indicate the appropriate ERR code using Morse code as shown below. **E R R 0 to 9** **ERR0 = . .-. .-. -----** **ERR1 = . .-. .-. . ----** **ERR2 = . .-. .-. . . ---** **ERR3 = . .-. .-. . . . --** **ERR4 = . .-. .-. . . . . -** **ERR5 = . .-. .-. . . . . .** **ERR6 = . .-. .-. -. . . .** **ERR7 = . .-. .-. --. . .** **ERR8 = . .-. .-. ---. .** **ERR9 = . .-. .-. ---- .**	

Entr StPt	**Enter Set point (Press Arrow & Enter)**
Cause:	The controller is prompting the operator to enter a set point.

LO	**Low Main Voltage (Function Codes Cd27-38 disabled and NO alarm stored.)**
Cause:	This message will be alternately displayed with the set point whenever the supply voltage is less than 75% of its proper value.

OLd CntrL	**Hardware does not include a triac on the KA06 output**
Cause:	ML3 controllers with configuration variable 57 set to ”3” will generate this message. This message will swap being the number one priority message with the highest priority message in the list above.

4.12 Controller Pre-Trip Test Codes

Table 4–4 Controller Pre-Trip Test Codes

Code	Title	Description
NOTICE **“Auto” or “Auto1” menu includes the: P0, P1, P2, P3, P4, P5, P6 and rSLts. “Auto2” menu includes P0, P1, P2, P3, P4, P5, P6, P7, P8, P9, P10 and rSLts. “Auto3” menu includes P0, P1, P2, P3, P4, P5, P6, P7 and P8.**		

Table 4–4 Controller Pre-Trip Test Codes

Code	Title	Description
P0-0	Pre-Trip Initiated: Configuration Display, Indicator Lamps, LEDs, and Displays	Container identifier code, Cd18 Software Revision Number, Cd20 Container Unit Model Number, & configuration database identifier CFMMYYDD are displayed in sequence. Next the unit will indicate the presence or non-presence of an RMU according to whether any RMU inquiry messages have been received since the unit was booted. Units equipped with Autoslide Enabled (Cnf44) will cause the vent to seek to its closed position, followed by two sequences of opening to 100% and returning to the closed position. No other autoslide mode of operation will be available until the two cycles of opening and closing have completed. Since the system cannot recognize lights and display failures, there are no test codes or results associated with this phase of Pretrip. To know if the test passes the operator must observe that the LCD display elements and the indicator lights behave as described below.

P1 Tests - Heaters Current Draw: Heater is turned on, then off. Current draw must fall within specified range. No other system components will change state during this test.

Code	Title	Description
P1-0	Heaters Turned On	Heater starts in the off condition, current draw is measured, and then the heater is turned on. After 15 seconds, the current draw is measured again. The change in current draw is then recorded. Test passes if the change in current draw test is in the range specified.
P1-1	Heaters Turned Off	Heater is then turned off. After 10 seconds, the current draw is measured. The change in current draw is then recorded. Test passes if change in current draw test is in the range specified.

P2 Tests - Condenser Fan Current Draw: Condenser is first verified in low speed then in high speed. Current draw must fall within specified range. No other system components will change state during this test. If the Water Pressure Switch is open this test will be skipped.

Code	Title	Description
P2-0	Condenser Fan Low Speed	Condenser fan starts in the off condition, current draw is measured, and Condenser low speed fan is then turned on. After 10 seconds the current draw is measured again. The change in current draw is then recorded. After the current is measured the Condenser fan is turned off and after 10 seconds a second off measurement is taken. Test passes if change in current draw test is in the specified range.
P2-1	Condenser Fan High Speed	Condenser fan starts in the off condition, current draw is measured, and condenser fan is then turned on. After 10 seconds the current draw is measured again. After the current is measured the Condenser fan is turned off and after 10 seconds a second off measurement is taken. Test passes if change in current draw test is in the specified range.

P3 Tests - Low Speed Evaporator Fan Current Draw: The system must be equipped with a low speed evaporator fan, as determined by CnF02, the Evaporator Fan Speed Select configuration variable. Low speed evaporator fan is turned on, then off. Current draw must fall within specified range. No other system components will change state during this test

NOTICE

If unit configured for single evaporator fan operation and either AL11 or AL12 is active at the start of either test, then the test will fail immediately. If AL11 or AL12 become active during the test, then the test will fail upon conclusion of the test.

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Code	Title	Description
P3-0	Low Speed Evaporator Fan Motors On	High speed evaporator fans will be turned on for 20 seconds, the fans will be turned off for 4 seconds, current draw is measured, and then the low speed evaporator fans are turned on. After 60 seconds the current draw is measured again. The change in current draw is then recorded. Test passes if change in current draw test is in the specified range.
P3-1	Low Speed Evaporator Fan Motors Off	Low speed evaporator fans are then turned off. After 10 seconds the current draw is measured. The change in current draw is then recorded. Test passes if change in current draw test is in the specified range.

P4 Tests - High Speed Evaporator Fans Current Draw: High speed evaporator fans are turned on, then off. Current draw must fall within specified range and measured current changes must exceed specified ratios. No other system components will change state during this test.

NOTICE

If unit configured for single evaporator fan operation and either AL11 or AL12 is active at the start of either test, the test will fail immediately. If AL11 or AL12 become active during the test, the test will fail upon conclusion of the test.

Code	Title	Description
P4-0	High Speed Evaporator Fan Motors On	Evaporator fans start in the off condition, current draw is measured, then high speed evaporator fans will be turned on. After 60 seconds the current draw is measured again. The change in current draw is then recorded. Test passes if change in current draw in the specified range AND measured current changes exceed specified ratios. If the three phase motors are configured IN, the change ratio test is skipped.
P4-1	High Speed Evaporator Fan Motors Off	High speed evaporator fans are then turned off. After 10 seconds the current draw is measured. The change in current draw is then recorded. Test passes if change in current draw test is in the specified range.

P5 Tests - Air Stream Temperature Sensor Tests: Tests the validity of the Air Stream Temperature Sensors.

Code	Title	Description
P5-0	Supply/Return Probe Test	The High Speed Evaporator Fan is turned on and run for eight minutes, with all other outputs de-energized. A temperature comparison is made between the return and supply probes. Test passes if temperature comparison falls within the specified range. **NOTICE** **If this test fails, “P5-0” and “FAIL” will be displayed. If both Probe tests (this test and the PRIMARY/ SECONDARY) pass, display will read “P5” “PASS.”**

Code	Title	Description
P5-1	Supply Probe Test	This test if for units equipped with secondary supply probe only. The temperature difference between primary supply probe and secondary supply probe is compared. Test passes if temperature comparison falls within the specified range. **NOTICE** **If this test fails, “P5-1” and “FAIL” will be displayed. If both Probe tests (this and the SUPPLY/RETURN TEST) pass, because of the multiple tests, the display will read “P 5” “PASS.”**
P5-2	Return Probe Test	For units equipped with secondary return probe only. The temperature difference between return temperature sensor (RTS) and return temperature sensor (RRS) probe is compared. Test passes if temperature comparison falls within the specified range. **NOTICE** **1. If this test fails, “P5-2” and “FAIL” will be displayed. If both Probe tests (this test and the SUPPLY/RETURN) pass, because of the multiple tests, the display will read “P 5,” “PASS.”** **2. The results of Pre-trip tests 5-0, 5-1 and 5-2 will be used to activate or clear control probe alarms.**
P5-3	Evaporator Fan Direction Test	With evaporator fan running on high speed, measure the temperature difference between the primary supply and primary return probes. Turn the heaters on for 60 seconds then measure the temperature difference between the primary supply and primary return probes for up to 120 additional seconds. This is a Pass/Fail test. The test passes if differential of STS is 0.25°C higher than RTS. Test P5-0 must pass before this test is run.
P5-7	Primary vs Secondary Evaporator Temperature Sensor Test	This is a Pass/Fail test of the primary evaporator temperature sensor (ETS1) and secondary evaporator temperature sensor (ETS2). Test passes if secondary evaporator temperature sensor (ETS2) is within +/ - 0.5°C of the primary evaporator temperature sensor (ETS1).
P5-8	Future Expansion	This is no longer active and will be displayed as “-----” at this time.
P5-9	Suction (Evaporator) Pressure Transducer Test	Units equipped with a secondary Evaporator pressure transducer. Test passes if suction pressure transducer (SPT) is within +/- 1.5 psi of the evaporator pressure transducer (EPT). Test P5-8 must pass before this test is run.
P5-10	Humidity Sensor Controller Configuration Verification Test	This is a Pass/Fail/Skip test of the humidity sensor configuration. Test passes if the controller configuration has humidity sensor in. Test fails if the controller configuration has humidity sensor out and Vout is greater than 0.20 Volts for the humidity sensor. Test is skipped if the controller configuration has the humidity sensor out and Vout is less than 0.20 Volts. Test P5-9 must pass before this test is run.

Code	Title	Description
P5-11	Humidity Sensor Installation Verification Test	This is a Pass/Fail test of humidity sensor installation (sensor is present). Test passes if Vout is greater than 0.20 Volts for the humidity sensor. Test fails if Vout is less than 0.20 Volts for the humidity sensor. Test P5-10 must pass before this test is run.
P5-12	Humidity Sensor Range Check Test	This is a Pass/Fail test of the Humidity Sensor Range. Test passes if Vout for the humidity sensor is between 0.33 Volts and 4 Volts. Test fails if Vout is outside of this range. Test P5-11 must pass before this test is run.

P6 Tests - Refrigerant Probes, Compressor and Refrigerant Valves: Pass/Fail testing is performed for the compressor, EEV, DUV, ESV, and the refrigerant pressure and temperature sensors.

Code	Title	Description
P6-0	Discharge Thermistor Test	If Alarm 64 is active the test fails. Otherwise, the test passes.
P6-1	Suction Thermistor Test	If the Suction Temperature Sensor (CPSS) both is configured ON and is invalid, the test fails. Otherwise the test passes.
P6-2	Discharge Pressure Transducer Test	If Alarm 65 is active any time during the first 45 second period, the test fails. Otherwise, the test passes.
P6-3	Suction Pressure Transducer Test	If Alarm 66 is active the test fails. Otherwise the test passes.
P6-4	Compressor Current Draw Test	Compressor current is tested before and 10 seconds after start up. If current does not increase, the test fails. P6-7 is run at the end of P6-4. If this test fails, P6-6 is skipped.
P6-5	Compressor Leak Test	Pre-trip P6-5 ensures that the compressor holds pressure. After compressor pump up and pump down, the compressor is turned off for 62 seconds. When suction side pressure holds (less than 8 psi rise) for 10 seconds, P6-5 passes, otherwise the Compressor Leak Test fails.
NOTICE **P6-6 through P6-10 are conducted by changing status of each valve and comparing suction pressure change and/or compressor current change with predetermined values. Tests will cause compressor and condenser fans to cycle on and off as needed to generate the pressure required for individual Pre-trip sub tests. The compressor will start in order to build discharge pressure, followed by compressor pump down sequence. At the conclusion of compressor pump down sequence, the compressor will shut down and the valve test will start.**		
P6-6	Economizer Valve Test	Passes if suction pressure increases a minimum of 4 psia when the valve opens for 15 seconds.
P6-7	Digital Loader/ Unloader Valve Test	Passes if pressure and current changes are within predetermined values 3 seconds after DLV/DUV switch signal. If it does not pass then refer to **Section 7.20**
P6-10	Electronic Expansion Valve Test	The test records the suction pressure during the open valve position and passes if the suction pressure increase is above 3 psi when the valve opens for 10 seconds.

NOTICE

P7-0 & P8 are included with “Auto2 & Auto3” only. P9-0 through P10 are included with “Auto2” only.

P7 Tests - High Pressure Tests: Unit is run at full capacity without condenser fan running to make sure that the HPS opens and closes properly.

Code	Title	Description
P7-0	High Pressure Switch (HPS) Opening Test	Test is skipped if sensed ambient temperature is less than 7.2°C (45°F), return air temperature is less than -17.8°C (0°F), or the water pressure switch is open. With the unit running, the condenser fan is turned off and a 900 second (15 minute) timer is started. The right display shows Discharge Pressure if the sensor is configured and valid, else Discharge Temperature. The unit needs to disable Discharge Pressure limit and enable Current Limit checks. The test fails immediately if: -Ambient Temperature Sensor invalid -Composite Return Temperature Sensor invalid -HPS is open The test fails if: -HPS fails to open before 900 seconds total test time. -Evaporator or Compressor IP Alarm. -Calculated Dome Temperature exceeds 137.78°C (280°F). -Discharge pressure exceeds 370 psig. -Compressor Current exceeds limits The test passes if HPS opens within the 15 minute time limit.
P7-1	High Pressure Switch (HPS) Closing Test	If return temperature greater than -2.4°C, set setpoint to -5.0°C, else set setpoint to -30°C. Restart unit according to normal startup logic. Run unit normally for 120 seconds. The test passes if the high pressure switch closes within 75 seconds after end of Test 7-0, else the test fails. Test P7-0 must pass for this test to execute.

P8 Tests - Perishable Mode Tests: Pretrip tests P7-0 and P7-1 must have passed or have been skipped for these tests to execute.

Code	Title	Description
P8-0	Perishable Mode Test	If the control temperature is below 15.6°C., the setpoint is changed to 15.6°C., and a 180 Minute timer is started. The control will then be placed in the equivalent of normal heating. If the control temperature is above 15.6°C. at the start of the test, then the test proceeds immediately to test 8-1. While in test 8-0 the right display will show the value of the control temperature.” The test fails if the 18°0 Minute timer expires before the control temperature reaches setpoint - 0.3°C. If the test fails, it will not auto-repeat. There is no pass display for this test. Once the control temperature reaches setpoint, the test proceeds to test 8-1.

Code	Title	Description
P8-1	Perishable Mode Pull Down Test / eAutoFresh CO_2 Sensor Calibration	Control temperature must be at least 15.6°C (60°F). The set point is changed to 0°C (32°F), and a 180-minute timer is started. The left display will read “P8-1,” the right display will show the supply air temperature. The unit will then start to pull down the temperature to the 0C set point. The test passes if the container temperature reaches set point before the 180-minute timer expires. On units where the CO_2 Sensor Status indicates that a CO_2 sensor is present, calibration of the CO_2 sensor will be attempted during P8-1. Once P8-1 begins, calibration will be attempted when the supply temperature goes below 5°C. If the CO_2 sensor voltage reads within the 0.95 <>1.15Vdc range before the end of P8-1, the sensor will be calibrated by holding the CO_2 zero line low for 4 seconds. Once calibration is performed, the sensor voltage will be verified to make sure it is in the 0.95 to 1.05 Vdc range. If the voltage is not within this range, CO_2 sensor calibration fails.
P8-2	Perishable Mode Maintain Temperature Test	Test P8-1 must pass for P8-2 to execute. A fifteen minute timer is started, and the system will attempt to minimize control temperature error (supply temperature minus setpoint) until the timer expires. The control temperature will be sampled each minute starting at the beginning of P8-2. During P8-2, the left display will read “P8-2,” and the right display will show the supply air temperature. When the test is completed, the average control temperature error will be compared to the pass/fail criteria. Test passes if the average temperature error is within +/- 1.0°C. Test fails if the average temperature error is greater than +/- 1.0°C, or if the DataCORDER supply temperature probe is invalid. If the test fails, the control probe temperature will be recorded as -50.0°C.

P9 Test - DTT Close and Open Test: The DTT in this control is not a physical device, with actual metallic contacts, it is a software function that acts similar to a thermostat. Using various temperature inputs, the DTT function determines whether a thermostat mounted on the Evaporator Coil would have OPEN or CLOSED contacts. Primarily, the DTT function operates based on the temperature reading from the Defrost Termination Sensor.

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Code	Title	Description
P9-0	DTT Closed and Open Test	P9-0 DTT Closed and Open Test During P9-0 the defrost temperature sensor (DTS) reading will be displayed on the left display. The right display will show the supply air temperature. The unit will run FULL COOL for 30 minutes maximum until the DTT is considered closed. This step may not have to be executed. Once the DTT is considered closed, the unit simulates defrost by running the heaters for up to two hours, or until the DTT is considered open. Test fails if: The DTT is not considered closed after the 30 minutes of full cooling HTT opens when DTT is considered closed or if return air temperature rises above 248°C (120°F). Test passes if the DTT is considered open within the 2 hour heat cycle time limit.

P10 Tests - Frozen Mode Tests:.

Code	Title	Description
P10-0	Frozen Mode Heat Test	If the container temperature is below 7.2°C, the setpoint is changed to 7.2°C., and a 180 Minute timer is started. The control will then be placed in the equivalent of normal heating. If the container temperature is above 7.2°C. at the start of the test, then the test proceeds immediately to test 10-1. During this test, the control temperature will be shown on the right display. The test fails if the 180 Minute timer expires before the control temperature reaches setpoint - 0.3°C. If the test fails, it will not auto-repeat. There is no pass display for this test. Once the control temperature reaches setpoint, the test proceeds to test 10-1.
P10-1	Frozen Mode Pulldown Test	Control temperature must be at least 7.2°C (45°F) The setpoint is changed to -17.8°C. The system will then attempt to pull down the control temperature to setpoint using normal frozen mode cooling. During this test, the control temperature will be shown on the right display. The test passes if the control temperature reaches setpoint minus 0.3°C before the 180 minute timer expires. Otherwise, the test fails. Upon failure and when initiated by an automatic Pre-trip sequence, P10-1 will auto-repeat once by starting P10-0 over again.
P10-2	Frozen Mode Maintain Temperature Test	Test P10-1 must pass for this test to execute. Same as for test 8-2 except the control temperature is the return probe temperature. The average error must be +/-1.6°C. If the DataCORDER supply temperature probe is invalid, the test fails and the control probe temperature will be recorded as -50°C. Upon failure and when initiated by an automatic Pre-trip sequence, P10-2 will auto-repeat by starting P10-0 over again.

Table 4–5 DataCORDER Function Code Assignments

NOTE: Inapplicable Functions display “-----”		
To Access: Press ALT.MODE key then CODE SELECT key		
Code No.	**Title**	**Description**
dC1	Recorder Supply Temperature	Current reading of the supply recorder sensor.
dC2	Recorder Return Temperature	Current reading of the return recorder sensor.
dC3-5	USDA 1,2,3 Temperatures	Current readings of the three USDA probes.
dC6-13	Network Data Points 1-8	Current values of the network data points (as configured). Data point 1 (Code 6) is generally the humidity sensor and its value is obtained from the controller once every minute.
dC14	Cargo Probe 4 Temperature	Current reading of the cargo probe #4.
dC15-19	Future Expansion	These codes are for future expansion, and are not in use at this time.
dC20-24	Temperature Sensors 1-5 Calibration	Current calibration offset values for each of the five probes: supply, return, USDA #1, #2, and #3. These values are entered via the interrogation program.
dC25	Future Expansion	This code is for future expansion, and is not in use at this time.
dC26,27	S/N, Left 4, Right 4	The DataCORDER serial number consists of eight characters. Function code dC26 contains the first four characters. Function code dC27 contains the last four characters. (This serial number is the same as the controller serial number.)
dC28	Minimum Days Left	An approximation of the number of logging days remaining until the DataCORDER starts to overwrite the existing data.
dC29	Days Stored	Number of days of data that are currently stored in the DataCORDER.
dC30	Date of Last Trip start	The date when a Trip Start was initiated by the user. In addition, if the system goes without power for seven continuous days or longer, a trip start will automatically be generated on the next AC power up. Press and hold “ENTER” key for five seconds to initiate a “Trip Start.”
dC31	Battery Test Results	Shows the current status of the optional battery pack. **PASS:** Battery pack is fully charged. **FAIL:** Battery pack voltage is low.
dC32	Time: Hour, Minute	Current time on the real time clock (RTC) in the DataCORDER.
dC33	Date: Month, Day	Current date (month and day) on the RTC in the DataCORDER.
dC34	Date: Year	Current year on the RTC in the DataCORDER.
dC35	Cargo Probe 4 Calibration	Current calibration value for the Cargo Probe. This value is an input via the interrogation program.

Table 4–6 DataCORDER Pre-Trip Result Records

Test	Title	Data
1-0	Heater On	Pass / Fail / Skip Result, Change in current for Phase A, B and C
1-1	Heater Off	Pass / Fail / Skip Result, Change in currents for Phase A, B and C
2-0	Condenser Fan On	Pass / Fail / Skip Result, Water pressure switch (WPS) - Open / Closed, Change in currents for Phase A, B and C
2-1	Condenser Fan Off	Pass / Fail / Skip Result, Change in currents for Phase A, B and C
3-0	Low Speed Evaporator Fan On	Pass / Fail / Skip Result, Change in currents for Phase A, B and C
3-1	Low Speed Evaporator Fan Off	Pass / Fail / Skip Result, Change in currents for Phase A, B and C
4-0	High Speed Evaporator Fan On	Pass / Fail / Skip Result, Change in currents for Phase A, B and C
4-1	High Speed Evaporator Fan Off	Pass / Fail / Skip Result, Change in currents for Phase A, B and C
5-0	Supply/Return Probe Test	Pass / Fail / Skip Result, STS, RTS, SRS and RRS
5-1	Secondary Supply Probe (SRS) Test	Pass / Fail / Skip
5-2	Secondary Return Probe (RRS) Test	Pass / Fail / Skip
5-3	Evaporator Fan Direction Test	Pass / Fail / Skip
5-7	Primary vs. Secondary Evaporator Temperature Sensor Test	Pass / Fail / Skip
5-8	Future Expansion	Not Run
5-9	Primary vs. Secondary Evaporator Pressure Transducer Test	Pass / Fail / Skip
5-10	Humidity Sensor Controller Configuration Verification Test	Pass / Fail / Skip
5-11	Humidity Sensor Installation Verification Test	Pass / Fail / Skip
5-12	Humidity Sensor Range Check Test	Pass / Fail / Skip
6-0	Discharge Thermistor Test	Pass / Fail / Skip
6-1	Suction Thermistor Test	Pass / Fail / Skip
6-2	Discharge Pressure Sensor Test	Pass / Fail / Skip
6-3	Suction Pressure Sensor Test	Pass / Fail / Skip
6-4	Compressor Current Draw Test	Pass / Fail / Skip
6-5	Compressor Leak Test	Pass / Fail / Skip
6-6	Economizer Valve Test	Pass / Fail / Skip
6-7	Digital Unloader Valve Test	Pass / Fail / Skip
6-9	Liquid Injection Valve Test (If Equipped)	Pass / Fail / Skip
6-10	Electronic Expansion Valve Test	Pass / Fail / Skip
7-0	High Pressure Switch Closed	Pass / Fail / Skip Result, AMBS, DPT or CPT (if equipped) Input values that component opens
7-1	High Pressure Switch Open	Pass / Fail / Skip Result, STS, DPT or CPT (if equipped) Input values that component closes
8-0	Perishable Mode Heat Test	Pass / Fail / Skip Result, STS, time it takes to heat to 16°C (60°F)

Table 4–6 DataCORDER Pre-Trip Result Records

Test	Title	Data
8-1	Perishable Mode Pulldown Test	Pass / Fail / Skip Result, STS, time it takes to pull down to 0°C (32°F)
8-2	Perishable Mode Maintain Test	Pass / Fail / Skip Result, Averaged DataCORDER supply temperature (SRS) over last recording interval.
9-0	Defrost Test	Pass / Fail / Skip Result, DTS reading at end of test, line voltage, line frequency, time in defrost.
10-0	Frozen Mode Heat Test	Pass / Fail / Skip Result, STS, time unit is in heat.
10-1	Frozen Mode Pulldown Test	Pass / Fail / Skip Result, STS, time to pull down unit to -17.8°C (0°F).
10-2	Frozen Mode Maintain Test	Pass / Fail / Skip Result, Averaged DataCORDER return temperature (RRS) over last recording interval.

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Table 4–7 DataCORDER Alarms

To Access: Press ALT. MODE key then ALARM LIST key		
Code	**Title**	**Description**
dAL70	Recorder Supply Temperature Out of Range	The supply recorder sensor reading is outside of the range of -50°C to 70°C (-58°F to +158°F), or the probe check logic has determined there is a fault with this sensor. **NOTICE** **The P5 Pre-trip test must be run to inactivate the alarm.**
dAL71	Recorder Return Temperature Out of Range	The return recorder sensor reading is outside of the range of -50°C to 70°C (-58°F to +158°F), or the probe check logic has determined there is a fault with this sensor. **NOTICE** **The P5 Pre-trip test must be run to inactivate the alarm.**
dAL72-74	USDA Temperatures 1, 2, 3 Out of Range	The USDA probe temperature reading is outside of -50°C to 70°C (-58°F to +158°F) range.
dAL75	Cargo Probe 4 Out of Range	The cargo probe temperature reading is outside of -50°C to 70°C (-58°F to +158°F) range.
dAL76, 77	Future Expansion	These alarms are for future expansion and are not in use at this time.
dAL78-85	Network Data Point 1 - 8 Out of Range	The network data point is outside of its specified range. The DataCORDER is configured by default to record the supply and return recorder sensors. The DataCORDER may be configured to record up to eight additional network data points. An alarm number (AL78 to AL85) is assigned to each configured point. When an alarm occurs, the DataCORDER must be interrogated to identify the data point assigned. When a humidity sensor is installed, it is usually assigned to AL78.

Table 4–7 DataCORDER Alarms

To Access: Press ALT. MODE key then ALARM LIST key		
Code	**Title**	**Description**
dAL86	RTC Battery Low	The real time clock (RTC) backup battery is too low to adequately maintain the RTC reading. A real time clock failure is critical to the operation of the unit. If this alarm occurs, replace the RTC battery at the next available opportunity. After replacing the battery the following actions are required: • Update the RTC setting • Update the unit’s software configuration • Update the operational software • Update all user selectable function code settings (defrost, setpoint, etc)
dAL87	RTC Failure	An invalid time has been detected. Either the DataCORDER run time hour and minute have not changed at the start of the hour, or the real time clock (RTC) time has gained or lost more than 2 minutes in the hour. This situation may be corrected by cycling the power, setting the clock or meeting the above criteria for an hour.
dAL88	DataCORDER EEPROM Failure	A write of critical DataCORDER information to the EEPROM has failed.
dAL89	Flash Memory Error	Error An error has been detected in the process of writing daily data to the non-volatile FLASH memory.
dAL90	Future Expansion	This alarm is for future expansion, and is not in use at this time.
dAL91	Alarm List Full	The DataCORDER alarm queue is determined to be full (eight alarms).

SECTION 5

OPERATION

5.1 Inspection (Before Loading)

⚠ **WARNING**

Beware of unannounced starting of the evaporator and condenser fans. The unit may cycle the fans and compressor unexpectedly as control requirements dictate.

1. Check inside for the following:
    - Check channels or “T” bar floor for cleanliness. Channels must be free of debris for proper air circulation.
    - Check container panels, insulation and door seals for damage. Effect permanent or temporary repairs.
    - Visually check evaporator fan motor mounting bolts for proper securement (refer to **Section 7.14**).
    - Check for visible corrosion on the evaporator stator and fan deck (refer to **Section 7.14**).
    - Check for dirt or grease on evaporator fans or fan deck and clean if necessary.
    - Check evaporator coil for cleanliness or obstructions. Wash with fresh water (refer to **Section 7.13**).
    - Check defrost drain pans and drain lines for obstructions and clear if necessary. Wash with fresh water.
    - Check panels on refrigeration unit for loose bolts and condition of panels. Make sure T.I.R. devices are in place on access panels.
2. Check condenser coil for cleanliness. Wash with fresh water (refer to **Section 7.10**).
3. Open control box door. Check for loose electrical connections or hardware.
4. Check color of moisture-liquid indicator.

5.2 Connect Power

⚠ **WARNING**

Do not attempt to remove power plug(s) before turning OFF start-stop switch (ST), unit circuit breaker(s) and external power source.

⚠ **WARNING**

Make sure the power plugs are clean and dry before connecting to power receptacle.

5.2.1 Connection To 380/460 VAC Power

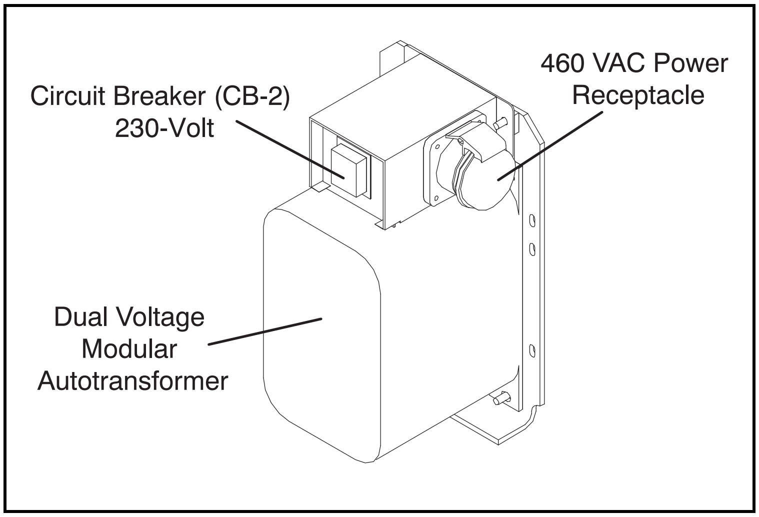
1. Make sure start-stop switch (ST on control panel) and circuit breaker (CB-1 in the control box) are in position “0” (OFF).
2. Plug the 460 VAC (yellow) cable into a de-energized 380/460 VAC, 3-phase power source. Energize the power source.
3. Place circuit breaker (CB-1) in position “I” (ON).
4. Close and secure control box door.

5.2.2 Connection To 190/230 VAC Power

An autotransformer (**Figure 5.1**) is required to allow operation on nominal 230 volt power. It is fitted with a 230 VAC cable and a receptacle to accept the standard 460 VAC power plug. The 230 volt cable is black in color while the 460 volt cable is yellow. The transformer may also be equipped with a circuit breaker (CB-2). The transformer is a step up transformer that will provide 380/460 VAC, 3-phase, 50/60 Hz power to the unit when the 230 VAC power cable is connected to a 190/230 VAC, 3-phase power source.

1. Make sure that the start-stop switch (ST, on control panel) and circuit breakers CB-1 (in the control box and CB-2 (on the transformer) are in position “0” (OFF).
2. Plug in and lock the 460 VAC power plug at the receptacle on the transformer.
3. Plug the 230 VAC (black) cable into a de-energized 190/230 VAC, 3-phase power source. Energize the power source.
4. Set circuit breakers CB-1 and CB-2 to position “I” (ON).
5. Close and secure control box door.

Figure 5.1 Autotransformer



5.3 Adjust Fresh Air Makeup Vent

The purpose of the fresh air makeup vent is to provide ventilation for commodities that require fresh air circulation. The vent must be closed when transporting frozen foods.

Air exchange depends on static pressure differential, which will vary depending on the container and how the container is loaded.

Units may be equipped with a vent position sensor (VPS). The VPS determines the position of the fresh air vent (upper or lower, as equipped) and sends data to the controller display.

5.3.1 Upper Fresh Air Makeup Vent

Two slots and a stop are designed into the Upper Fresh Air disc for air flow adjustments. The first slot allows for a 0 to 30% air flow; the second slot allows for a 30 to 100% air flow.

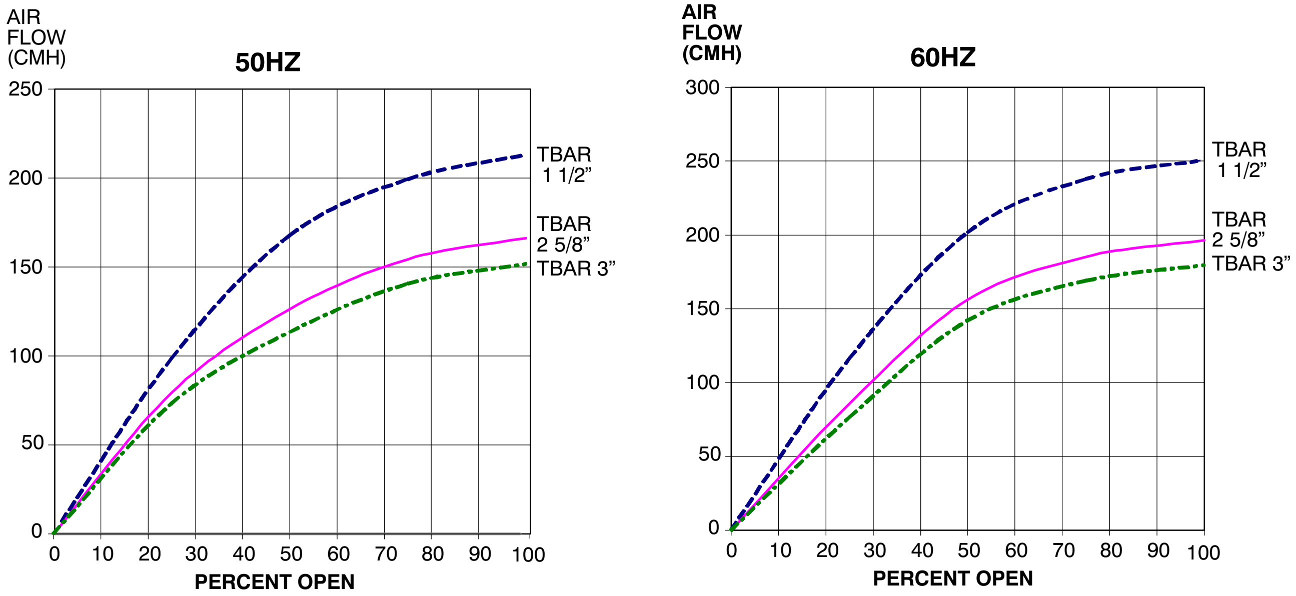
To adjust the percentage of air flow, loosen the wing nut and rotate the disc until the desired percentage of air flow matches with the arrow. Tighten the wing nut.

To clear the gap between the slots, loosen the wing nut until the disc clears the stop.

Figure 5.2 gives air exchange values for an empty container.

Higher values can be expected for a fully loaded container.

Figure 5.2 Upper Fresh Air Make Up Flow Chart



5.3.2 Lower Fresh Air Makeup Vent

a. Full Open or Closed Positions

Maximum air flow is achieved by loosening the wing nuts and moving the cover to the maximum open position (100% position). The closed position is 0% air flow position. The operator may also adjust the opening to increase or decrease the air flow volume to meet the required air flow.

b. Reduced Flow for Lower Fresh Air Makeup

NOTICE

In order to prevent inaccurate display readings on units equipped with a Vent Position Sensor (VPS), ensure that the rack and pinion drive of the VPS is not disrupted when adjusting the air makeup vent.

NOTICE

Do not loosen the hex nut beyond its stop. Doing so may cause inaccurate display readings and errors in DataCORDER reports.

Similar to the Upper Fresh Air Makeup vent, two slots and a stop are designed into the Lower Fresh Air slide for air flow adjustments. The first slot allows for a 0 to 25% air flow; the second slot allows for a 25 to 100% air flow. To adjust the percentage of air flow, loosen the hex nut and rotate the disc until the desired percentage of air flow matches with the arrow. Tighten the hex nut. To clear the gap between the slots, loosen the hex nut until the disc clears the stop.

On some models the air slide is supplied with two adjustable air control discs. The fresh air makeup can be adjusted for 15, 35, 50 or 75 cubic meters per hour (CMH). The air flow has been established at 60 Hz power and 2-1/2 inch T bar and with 15 mm (0.6 inch) H_2O external static above free blow.

Loosen the hex nut, adjust each disc to the required air flow, then tighten hex nut.

NOTICE

The main air slide is in the fully closed position during reduced air flow operation when equipped with air control discs.

c. Air Sampling for Carbon Dioxide (CO_2) Level Loosen hex nuts and move the cover until the arrow on the cover is aligned with the “atmosphere sampling port” label. Tighten the hex nuts and attach a 3/8 in. hose to the sampling port. If the internal atmosphere content has reached an unacceptable level, the operator may adjust the disc opening to meet the required air flow volume to ventilate the container.

5.3.3 Vent Position Sensor

The VPS allows the user to determine the position of the fresh air vent via Cd45. This function code is accessible via the Code Select key.

The vent position will display for 30 seconds whenever motion corresponding to 5 CMH (3 CFM) or greater is detected. It will scroll in intervals of 5 CMH (3 CFM). Scrolling to Cd45 will display the Fresh Air Vent Position.

The position of the vent will be recorded in the DataCORDER whenever the unit is running under AC power and any of the following:

Trip start

On every power cycle

Midnight

Manual changes greater than 5 CMH (3 CFM) remaining in the new position for at least four minutes

NOTICE

The user has four minutes to make necessary adjustments to the vent setting. This time calculation begins on the initial movement of the sensor. The vent can be moved to any position within the four minutes. On completion of the first four minutes, the vent is required to remain stable for the next four minutes. If vent position changes are detected during the four minute stability period, AL50 will be generated. This provides the user with the ability to change the vent setting without generating multiple events in the DataCORDER.

5.4 eAutoFresh Operation

The optional eAutoFresh™ venting system is controlled through two function codes, Code 43 and Code 44. Code 43 contains specific parameters for operation and Code 44 provides a visible display of component conditions.

Procedures and technical information related to the eAutoFresh™ venting system can be found in the **T-342 eAutoFresh Manual**, located in the Literature section of the Container Refrigeration website. To find the manual from the Literature section, click on Options > eAutoFresh.

5.5 XtendFRESH Operation

The optional XtendFRESH™ controlled atmosphere system is controlled through two function codes, Code 43 and Code 44. Code 43 contains specific parameters for operation and Code 44 provides a visible display of component conditions.

Procedures and technical information related to the XtendFRESH™ controlled atmosphere system can be found in the **T-366 XtendFRESH Manual**, located in the Literature section of the Container Refrigeration website. To find the manual from the Literature section, click on Options > XtendFRESH.

5.6 Connect Water-Cooled Condenser

The water-cooled condenser is used when cooling water is available and heating the surrounding air is objectionable, such as in a ship’s hold. If water-cooled operation is desired, connect in accordance with the following instructions.

5.6.1 Water-Cooled Condenser with Water Pressure Switch

1. Connect the water supply line to the inlet side of the condenser and the discharge line to the outlet side of the condenser (see **Figure 3.5**).
2. Maintain a flow rate of 11 to 26 liters per minute (3 to 7 gallons per minute). The water pressure switch will open to de-energize the condenser fan relay. The condenser fan motor will stop and will remain stopped until the water pressure switch closes.

3. To shift to air-cooled condenser operation, disconnect the water supply and the discharge line to the water-cooled condenser. The refrigeration unit will shift to air-cooled condenser operation when the water pressure switch closes.

5.6.2 Water-Cooled Condenser with Condenser Fan Switch

1. Connect the water supply line to the inlet side of condenser and the discharge line to the outlet side of the condenser (see **Figure 3.5**).
2. Maintain a flow rate of 11 to 26 lpm (3 to 7 gpm).
3. Set the condenser fan switch to position “O.” This will de-energize the condenser fan relay. The condenser fan motor will stop and remain stopped until the CFS switch is set to position “I.”

⚠ CAUTION

When condenser water flow is below 11 lpm (3 gpm) or when water-cooled operation is not in use, the CFS switch MUST be set to position “1” or the unit will not operate properly.

To shift to air-cooled condenser operation, stop the unit, set the CFS switch to position “I” and restart the unit. Disconnect the water lines to the water-cooled condenser

5.7 Connect Remote Monitoring Receptacle

If remote monitoring is required, connect the remote monitor plug at the unit receptacle, see **Figure 3.6**. When the remote monitor plug is connected to the remote monitoring receptacle, the following remote circuits are energized:

Circuit	Function
Sockets B to A	Energizes remote cool light
Sockets C to A	Energizes remote defrost light
Sockets D to A	Energizes remote in-range light

5.8 Starting and Stopping Instructions

⚠ WARNING

Make sure that the unit circuit breaker(s) (CB-1 & CB-2) and the START-STOP switch (ST) are in the “O” (OFF) position before connecting to any electrical power source.

NOTICE

The electronic phase detection system will check for proper compressor rotation within the first 30 seconds. If rotation is not correct, the compressor will be stopped and restarted in the opposite direction. If the compressor is producing unusually loud and continuous noise after the first 30 seconds of operation, stop the unit and investigate.

5.8.1 Starting the Unit

1. With power properly applied, the fresh air vent in proper position, place the START-STOP switch to “I” (ON), see **Figure 3.6**.
2. The Controller Function Codes for the container ID (Cd40), software version (Cd18) and unit model number (Cd20) will be displayed in sequence.
3. Continue with Start Up Inspection, **Section 5.9**.

5.8.2 Stopping the Unit

To stop the unit, place the START-STOP switch in position “0” (OFF).

5.9 Start-Up Inspection

5.9.1 Physical Inspection

Check rotation of condenser and evaporator fans.

5.9.2 Check Controller Function Codes

Check, and if required, reset controller Function Codes (Cd27 through Cd39) in accordance with desired operating parameters. Refer to Table 4–3.

5.9.3 Start Temperature Recorder DataCORDER

1. Check and, if required, set the DataCORDER Configuration in accordance with desired recording parameter. Refer to Section 4.8.3.
2. Enter a “Trip Start.” To enter a “Trip Start,” do the following:
   a. Depress the ALT MODE key. When the left display shows, dC, depress the ENTER key.
   b. Scroll to Code dC30.
   c. Depress and hold the ENTER key for five seconds.
   d. The “Trip Start” event will be entered in the Data-CORDER.

5.9.4 Complete Inspection

Allow the unit to run for five minutes to stabilize conditions, and then perform a Pre-trip diagnosis in accordance with Section 4.7.

5.10 Pre-Trip Diagnosis

⚠ CAUTION

Pre-trip inspection should not be performed with critical temperature cargoes in the container.

⚠ CAUTION

When Pre-trip key is pressed, economy, dehumidification and bulb mode will be deactivated. At the completion of Pre-trip activity, economy, dehumidification and bulb mode must be reactivated.

Pre-trip diagnosis provides automatic testing of the unit components using internal measurements and comparison logic. The program will provide a “PASS” or “FAIL” display to indicate test results.

The testing begins with access to a Pre-trip selection menu. The user may have the option of selecting one of two automatic tests.

These tests will automatically perform a series of individual Pre-trip tests. The user may also scroll down to select any of the individual tests.

When only the short sequence is configured, it will appear as “AUtO” in the display. Otherwise “AUtO1” will indicate the short sequence and “AUtO2” will indicate the long sequence. The test short sequence will run tests P0 through P6. The long test sequence will run tests P0 through P10.

A detailed description of the Pre-trip test codes is listed in Table 4–4. If no selection is made, the Pre-trip menu selection process will terminate automatically. However, dehumidification and bulb mode must be reactivated manually if required.

Scrolling down to the “rSLts” code and pressing ENTER will allow the user to scroll through the results of the last Pre-trip testing run. If no Pre-testing has been run (or an individual test has not been run) since the unit was powered up, “– – – –” will be displayed.

To start a Pre-trip test, do the following:

NOTICE

1. Prior to starting a Pre-trip test, verify that unit voltage (Cd07) is within tolerance and unit amperage draw (Cd04, Cd05, Cd06) are within expected limits. Otherwise, tests may fail incorrectly.

2. All alarms must be rectified and cleared before starting tests.

3. Pre-trip may also be initiated via communications. The operation is the same as for the keypad initiation described below except that should a test fail, the Pre-trip mode will automatically terminate. When initiated via communications, a Pre-trip test may not be interrupted with an arrow key, but the Pre-trip test can be terminated with the PRE-TRIP key.

1. Press the PRE-TRIP key to accesses the Pre-trip test selection menu.
2. TO RUN AN AUTOMATIC TEST: Scroll through the selections by pressing the UP ARROW or DOWN ARROW keys to display AUTO, AUTO 1, AUTO 2 or AUTO 3 as desired, then press ENTER.
    a. The unit will execute the series of tests without any need for direct user interface. These tests vary in length, depending on the component under test.
    b. While tests are running, “P#−#” will appear on the left display; the #’s indicate the test number and subtest. The right display will show a countdown time in minutes and seconds, indicating the amount of time remaining in the test.

⚠ CAUTION

When a failure occurs during automatic testing, the unit will suspend operation awaiting operator intervention.

When an automatic test fails, it will be repeated once. A repeated test failure will cause “FAIL” to be shown on the right display, with the corresponding test number to the left.

The user may then press the DOWN ARROW to repeat the test, the UP ARROW to skip to the next test, or the PRE-TRIP key to terminate testing. The unit will wait indefinitely or until the user manually enters a command.

⚠ CAUTION

When Pre-trip test Auto2 runs to completion without being interrupted, the unit will terminate Pre-trip and display “Auto 2” “end.” The unit will suspend operation until the user depresses the ENTER key!

When an Auto 1 Pre-trip test runs to completion without a failure, the unit will exit Pre-trip mode and return to normal control operation. However, dehumidification and bulb mode must be reactivated manually if required.

3. TO RUN AN INDIVIDUAL TEST: Scroll through the selections by pressing the UP ARROW or DOWN ARROW keys to display an individual test code. Pressing ENTER when the desired test code is displayed.
    a. Individually selected tests, other than the LED/Display test, will perform the operations necessary to verify the operation of the component. At the conclusion, PASS or FAIL will be displayed. This message will remain displayed for up to three minutes, during which time a user may select another test. If the three minute time period expires, the unit will terminate pre-trip and return to control mode operation.
    b. While the tests are being executed, the user may terminate the pre-trip diagnostics by pressing and holding the PRE-TRIP key. The unit will then resume normal operation. If the user decides to terminate a test but remain at the test selection menu, the user may press the UP ARROW key. When this is done, all test outputs will be de-energized and the test selection menu will be displayed.
    c. During Pre-trip testing, current limiting and pressure limiting are both active, except during P-7 (High Pressure Switch Testing) when pressure limiting is turned off.
4. Pre-Trip Test Results

At the end of the pre-trip test selection menu, the message “P,” “rSLts” (Pre-trip results) will be displayed.

Pressing the ENTER key will allow the user to see the results for all sub-tests (i.e., 1-0, 1-1, etc).

The results will be displayed as “PASS” or “FAIL” for all the tests run to completion since power up. If a test has not been run since power up, “-----” will be displayed.

Once all Pre-test activity is completed, dehumidification and bulb mode must be reactivated manually if required.

5.11 Probe Diagnostics

A complete temperature probe check is performed during the P5 Pre-trip test. A probe check is also run at the end of a defrost cycle; the defrost light will remain on during this period. If supply probes are within limits and return probes are within limits, the unit will return to normal operation. During normal operation, the controller continuously monitors and compares adjacent temperature probe readings.

The probe check procedure consists of running the evaporator fans for up to eight minutes in order to compare the readings from the adjacent temperature probes. If a significant difference in temperature readings is detected between probes, a defrost cycle, followed by another probe check may be initiated. Any continued disagreement between probes will prompt the controller to invalidate the failed temperature probe, and the backup probe will be used for temperature control.

In Perishable Mode, both pairs of supply and return probes are monitored for probe disagreement. Probe disagreement is considered a difference of 0.5°C (0.9°F) or greater between the supply air sensors and/or a difference of 2.0°C (3.6°F) between the return air sensors. Probe disagreement found in either pair can trigger a defrost probe check.

In Frozen Mode, only the controlling probes are considered. Disagreement of the controlling probes can trigger a defrost probe check, which will occur when the difference between the sensors is greater than 2.0°C (3.6°F). Normally, the controlling probes are the return probes but if both return probes are invalidated, the supply probes are used for control purposes. Probe disagreement of the non-controlling probe pair will not trigger a defrost probe check.

If after the defrost probe check the supply probes agree and return probes agree, all supply and return sensors are considered valid and the unit returns to normal control.

In the Case of Probe Disagreement:

If the supply probes disagree and the return probes agree, the controller will invalidate the worst supply probe. If the probe check is run as part of Pre-trip P-5, an alarm will be triggered for the invalidated probe. If it is a run time defrost probe check, the invalidated probe will be passed over and no alarm will be triggered. However, if the best supply probe is greater than 1.2°C (2.2°F) difference with respect to its return probes, the best supply probe is also invalidated. If unit is in Perishable Mode, a probe alarm will be triggered for both supply probes.

If the supply probes agree and the return probes disagree, invalidate the worst return probe. If the probe check is being run as part of Pre-trip P-5, an alarm will be triggered for the invalidated probe. If it is a run time defrost probe check, the invalidated probe will be passed over and no alarm will be necessary. If the best return probe is greater than 1.2°C (2.2°F) difference with respect to its supply probes, then the best return probe is also invalidated. If the unit is in perishable mode, a probe alarm will be triggered for both return probes.

5.12 TripWise (Option)

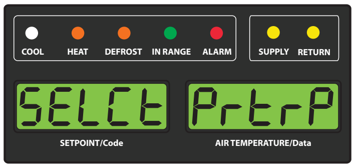
TripWise^{TM} is a new premium option available for PrimeLINE and PrimeLINE with Edge units. TripWise is software logic that runs during every voyage as often as possible to indicate whether a standard Pre-trip Inspection (PTI) is needed and skip unless necessary. The tests run in the background and are similar to those completed as part of the standard PTI selection, which includes the following:

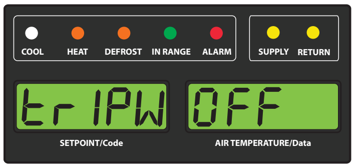
- Alarm Presence
- Evaporator Motor Current
- Heater Current
- Condenser Motor Current
- Compressor Current
- Humidity Sensor
- Supply / Return Sensors
- Evaporator Temperature and Pressure Sensors
- Defrost Temperature Sensor
- Electronic Expansion Valve
- RMU Presence
- Compressor Test
- Digital Loader / Unloader Valves
- Economizer Valve
- Temperature Control
- Suction / Discharge Temperature and Pressure

5.12.1 Checking TripWise Status

To check the status of the container, press the PRE-TRIP key on the keypad. The message “SELCt | PrtrP” will appear on the display module, alternating with one of the following TripWise status messages:

- <u>trIPW | OFF</u>. The TripWise option is turned off.
- <u>trIPW | EX</u> (Expired). It is recommended to pre-trip the unit prior to the unit's next trip following customer-specific guidelines.
- <u>trIPW | PASS</u>. The container should be ready for use after the operator has conducted a visual inspection. Standard PTI is not required.
- <u>trIPW | CHECK</u>. If any TripWise test(s) execute and do not meet the pass / fail requirements, It is recommended to pre-trip the unit following customer-specific guidelines prior to the unit's next trip.





Pressing the ENTER key while “SELCt | PrtrP” is displayed will enter into the Pre-trip test menu. Pressing the Arrow keys will navigate through the standard PTI test selections menu.

5.12.2 Enabling or Disabling TripWise Option

1. Press the CODE SELECT key on the keypad.
2. Use the Arrow keys to bring up code Cd65 in the display.
3. Press the ENTER key. The display will show either “-----”, “OFF” or “ON”.

NOTE

If “-----” is displayed, the TripWise function option is not active on the unit. To add this option to the unit, the equipment owner would need to contact their Regional Carrier Sales Manager.

4. Use the Arrow keys to toggle between “ON” and “OFF” and then press the ENTER key to select the desired option.
5. If “ON” is selected, the display will show “dAYS”. This is the expiration time (2 through 365 in 1 day increments). Use the Arrow keys to change the parameter and then press the ENTER key to confirm.

NOTE

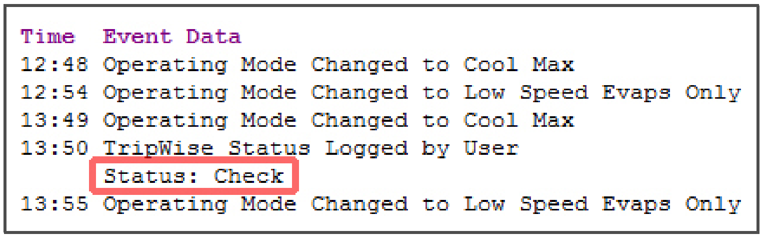
The expiration interval is the total maximum days allowed between the running of each test. For example, if days are set to 30 and the low speed evaporator fan test has not run within those 30 days, the

TripWise expired message will be displayed. If the TripWise expired message is displayed, it is recommended to Pre-trip the unit following customer specific guidelines prior to the next trip.

5.12.3 TripWise Status Event

A TripWise status event will be recorded in the DataCorder recorder when the PTI is selected. In the current DataLINE software release, the event will show the status of the unit.

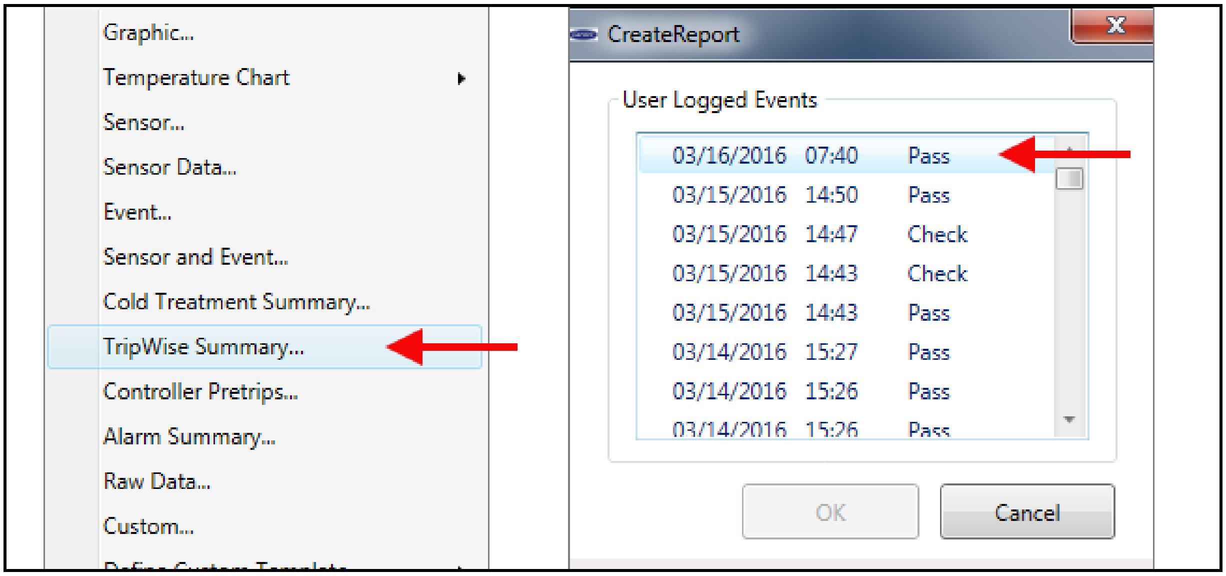
Figure 5.3 TripWise Status in DataCorder



```
Time  Event Data
12:48 Operating Mode Changed to Cool Max
12:54 Operating Mode Changed to Low Speed Evaps Only
13:49 Operating Mode Changed to Cool Max
13:50 TripWise Status Logged by User
      Status: Check
13:55 Operating Mode Changed to Low Speed Evaps Only
```

In DataLINE version 3.2, perform an all data download by selecting from the drop down menu “TripWise Summary” and then select a date in “User Logged Events” as shown in the Figure below.

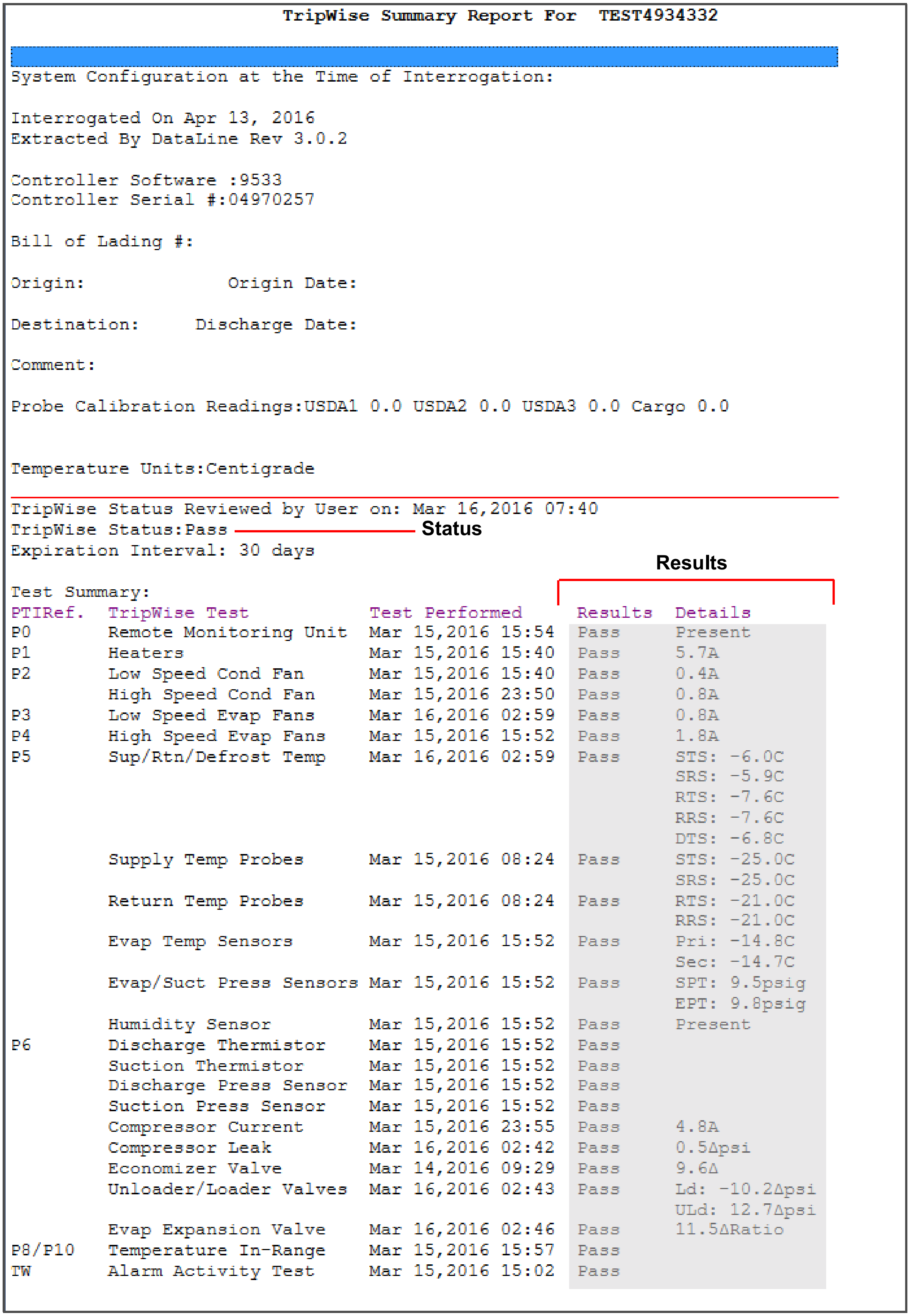
Figure 5.4 Generating TripWise Summary Report



```
03/16/2016  07:40  Pass
03/15/2016  14:50  Pass
03/15/2016  14:47  Check
03/15/2016  14:43  Check
03/15/2016  14:43  Pass
03/14/2016  15:27  Pass
03/14/2016  15:26  Pass
03/14/2016  15:26  Pass
```

This will generate the status / results in a DataLINE TripWise Summary Report as shown in the Figure below.

Figure 5.5 TripWise Summary Report



```
                         TripWise Summary Report For  TEST4934332

System Configuration at the Time of Interrogation:

Interrogated On Apr 13, 2016
Extracted By DataLine Rev 3.0.2

Controller Software :9533
Controller Serial #:04970257

Bill of Lading #:

Origin:             Origin Date:

Destination:     Discharge Date:

Comment:

Probe Calibration Readings:USDA1 0.0 USDA2 0.0 USDA3 0.0 Cargo 0.0


Temperature Units:Centigrade

TripWise Status Reviewed by User on: Mar 16,2016 07:40
TripWise Status:Pass
Expiration Interval: 30 days

Test Summary:
PTIRef.  TripWise Test            Test Performed     Results  Details
P0       Remote Monitoring Unit   Mar 15,2016 15:54  Pass     Present
P1       Heaters                  Mar 15,2016 15:40  Pass     5.7A
P2       Low Speed Cond Fan       Mar 15,2016 15:40  Pass     0.4A
         High Speed Cond Fan      Mar 15,2016 23:50  Pass     0.8A
P3       Low Speed Evap Fans      Mar 16,2016 02:59  Pass     0.8A
P4       High Speed Evap Fans     Mar 15,2016 15:52  Pass     1.8A
P5       Sup/Rtn/Defrost Temp     Mar 16,2016 02:59  Pass     STS: -6.0C
                                                              SRS: -5.9C
                                                              RTS: -7.6C
                                                              RRS: -7.6C
                                                              DTS: -6.8C
         Supply Temp Probes       Mar 15,2016 08:24  Pass     STS: -25.0C
                                                              SRS: -25.0C
         Return Temp Probes       Mar 15,2016 08:24  Pass     RTS: -21.0C
                                                              RRS: -21.0C
         Evap Temp Sensors        Mar 15,2016 15:52  Pass     Pri: -14.8C
                                                              Sec: -14.7C
         Evap/Suct Press Sensors Mar 15,2016 15:52  Pass     SPT: 9.5psig
                                                              EPT: 9.8psig
         Humidity Sensor          Mar 15,2016 15:52  Pass     Present
P6       Discharge Thermistor     Mar 15,2016 15:52  Pass
         Suction Thermistor       Mar 15,2016 15:52  Pass
         Discharge Press Sensor   Mar 15,2016 15:52  Pass
         Suction Press Sensor     Mar 15,2016 15:52  Pass
         Compressor Current       Mar 15,2016 23:55  Pass     4.8A
         Compressor Leak          Mar 16,2016 02:42  Pass     0.5Δpsi
         Economizer Valve         Mar 14,2016 09:29  Pass     9.6Δ
         Unloader/Loader Valves   Mar 16,2016 02:43  Pass     Ld: -10.2Δpsi
                                                              ULd: 12.7Δpsi
         Evap Expansion Valve     Mar 16,2016 02:46  Pass     11.5ΔRatio
P8/P10   Temperature In-Range     Mar 15,2016 15:57  Pass
TW       Alarm Activity Test      Mar 15,2016 15:02  Pass
```

5.13 Automatic Cold Treatment (Option)

Cold Treatment has been employed as an effective post-harvest method for the control of Mediterranean and certain other tropical fruit flies. Exposing infested fruit to temperatures of 2.2°C (3.6°F) or below for specific time periods results in the mortality of various life stages for this group of insects.

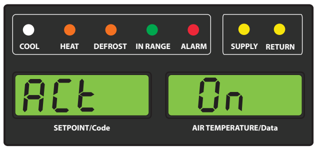
Automated Cold Treatment (ACT) in the Carrier Transicold unit is a method to simplify the task of completing cold treatment by automating the process of changing the setpoints. ACT is set up through function code Cd51. Refer to Function Code table in this manual for Cd51 menu processing and displays.

NOTE

ACT, setup with Cd51, and Automatic Setpoint Change (ASC), setup with Cd53, will not work simultaneously. Setting one will deactivate the other.

Procedure to Set ACT:

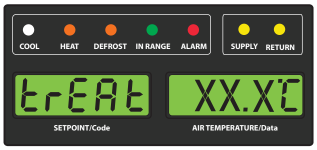
1. Enter the required cargo setpoint. It must be lower than the treatment temperature discussed in step 5.
2. Press the CODE SELECT key.
3. Use the Arrow keys to scroll to Cd51, and then press the ENTER key.
4. "ACt" is now displayed in the left display and the right will display "Off". Use the Arrow keys to bring up "On" in the right display and press the ENTER key.



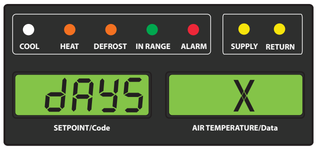
5. “trEAt" is now displayed in the left display and the right will be flashing the last setting (shown as XX.X°C). Use the Arrow keys to select the desired cold treatment setpoint and press the ENTER key.

NOTE

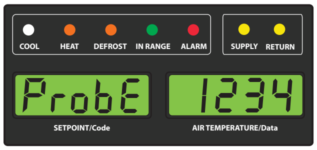
"trEAt" is the maximum value that the USDA probes need to remain below, to pass the Cold Treatment protocol. For instance, if the treat value is set at 35.0°F (1.7°C) then the USDA probe temperatures must remain below 35.0°F (1.7°C) to pass.



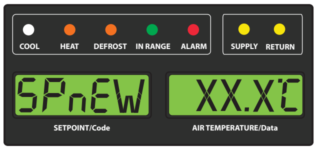
6. "dAyS" is now displayed in the left display and the right will be flashing. Use the Arrow keys to select the desired days for cold treatment and press the ENTER key.



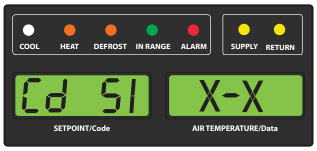
7. "ProbE" is now displayed in the left display and the right will display the probe numbers that are connected. Press the ENTER key. For instance, if "1234" is displayed, then all four of the probes are connected.



8. "SPnEW" is now displayed in the left display and the right will be flashing. Use the Arrow keys to select the desired setpoint after the cold treatment process has successfully completed and press the ENTER key. This would be the final temperature prior to the delivery of the cargo.



9. Cd51 is now displayed in the left display and the right will display days / hours remaining in cold treatment.

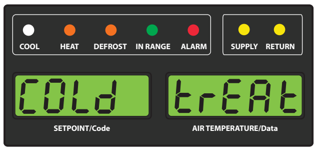


10. The unit will start to countdown once all detected USDA probes have reached the specified cold treatment temperature. The cold treatment process will continue until the specified number of days is reached. During operation, Cd51 will show the number of days and hours remaining in the cold treatment.

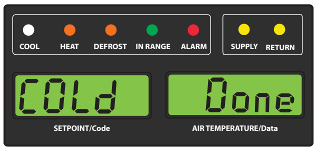
NOTE

Once the cold treatment process has been initiated, setpoint change via the keypad is disabled.

11. While the unit is operating in ACT mode, the left hand display will alternate between "COLd" and setpoint. The right hand display will alternate between "trEAt" and the cargo temperature. Once the treatment time has been completed, the setpoint temperature will increase to the "SPnEW" setting chosen in step 8.



12. When the cold treatment process is complete, the "SPnEW" setpoint will be displayed in the left hand display and cargo temperature in the right hand display, alternating with "COLd" "Done". "COLd" "Done" will continue to alternate with the setpoint and cargo temperature until ACT is turned off.



Procedure to Turn ACT OFF:

ACT will be automatically turned off with a TripWise, or if a Pretrip is initiated.

1. To manually turn ACT Off, press the CODE SELECT key.
2. Use the Arrow keys to scroll to Cd51, and then press the ENTER key.
3. Use the Arrow keys to bring up "Off" in the right display and press the ENTER key.

5.14 Automatic Setpoint Change (ASC) Cd53

Automatic Setpoint Change (ASC) allows up to 6 setpoint changes to be pre-programmed over defined periods of time using Cd53.

1. Press the CODE SELECT key.
2. Use the Arrow keys to scroll to Cd53, then press the ENTER key.
3. Use the Arrow keys to scroll to ON, then press the ENTER key. If ASC is already ON, selecting OFF will terminate ASC.
4. Select the desired number of setpoint changes (nSC) by scrolling through the available “flashing” options (1 – 6) in the right display, then press the ENTER key.
5. Select the initial setpoint: With (SP 0) in the left display, select by scrolling to the desired “flashing” setpoint in the right display and press ENTER.
6. Select the days desired for initial setpoint (SP 0): With (DAY 0) in the left display, select by scrolling to the desired “flashing” days (1 to 99) in the right display and press ENTER.
7. Select the next setpoint (SP 1): With (SP 1) in the left display, select by scrolling to the desired “flashing” setpoint in the right display and press ENTER.
8. Continue to select each additional setpoint.
9. Select a final setpoint (SP x): With (SP x) in the left display, select by scrolling to the desired “flashing” setpoint in the right display and press ENTER.

While the unit is operating in ASC mode, the left hand display will alternate between current unit setpoint and “ASC”. The right hand display will alternate between current control temperature and “ACtvE”. The user can determine the amount of time left at the current setpoint by selecting Cd53. The amount of time left will be displayed in the right display (XX (days) / XX (hours). By sequentially pressing ENTER, set parameters can be viewed.

At completion of ASC mode, the left hand display will alternate between current unit setpoint “ASC”. The right hand display will alternate between current control temperature and “Done”.

The display will remain this way until ASC is turned off. The user can determine the date of completion by selecting Cd53. With (done) in the left display, the date of completion will be displayed in the right display (Month / Day).

ASC can be manually turned off by selecting Cd53, scrolling to “Off” and pressing the ENTER key.

ACS will be automatically turned off after three days without power, or if a Pre-trip is initiated.

ACS (Cd53) will work independently of Automatic Cold Treatment (ACT) (Cd51). Setting one deactivates the other.

SECTION 6

TROUBLESHOOTING

6.1 Unit will not Start or Starts then Stops

Condition	Possible Cause	Remedy / Reference
No power to unit	External power source OFF	Turn On
	Start−Stop switch OFF or defective	Check
	Circuit breaker tripped or OFF	Check
	Autotransformer not connected	**Section 5.2.2**
Loss of control power	Circuit breaker OFF or defective	Check
	Control transformer defective	Replace
	Fuse (F3A/F3B) blown	Check
	Start−Stop switch OFF or defective	Check
Component(s) not operating	Evaporator fan motor internal protector open	**Section 7.14**
	Condenser fan motor internal protector open	**Section 7.11**
	Compressor internal protector open	**Section 7.8**
	High pressure switch open	**Section 6.7**
	Heat termination thermostat open	Replace
	Malfunction of current sensor	Replace

6.2 Unit Operates Long or Continuously in Cooling

Condition	Possible Cause	Remedy / Reference
Container	Hot load	Normal
	Defective box insulation or air leak	Repair
Refrigeration system	Shortage of refrigerant	**Section 7.7**
	Evaporator coil covered with ice	**Section 6.6**
	Evaporator coil plugged with debris	**Section 7.13**
	Air bypass around evaporator coil	Check
	Controller set too low	Reset
	Compressor service valves or liquid line shutoff valve partially closed	Open valves completely
	Dirty condenser	**Section 7.10.1**
	Compressor worn	**Section 7.8**
	Current limit (function code Cd32) set to wrong value	**Section 4.4.3**
	Economizer solenoid valve malfunction	**Section 7.18**
	Digital unloader valve stuck open	**Section 7.22**
	Electronic expansion valve	**Section 7.16**

6.3 Unit Runs but has Insufficient Cooling

Condition	Possible Cause	Remedy / Reference
Refrigeration system	Abnormal pressures	Section 6.7
	Abnormal temperatures	Section 6.15
	Abnormal currents	Section 6.16
	Controller malfunction	Section 6.9
	Evaporator fan or motor defective	Section 7.14
	Compressor service valves or liquid line shutoff valve partially closed	Open valves completely
	Frost on coil	Section 6.10
	Digital unloader valve stuck open	Section 7.22
	Electronic expansion valve	Section 7.16

6.4 Unit will not Heat or has Insufficient Heating

Condition	Possible Cause	Remedy / Reference
No operation of any kind	Start−Stop switch OFF or defective	Check
	Circuit breaker OFF or defective	Check
	External power source OFF	Turn ON
No control power	Circuit breaker or fuse defective	Replace
	Control Transformer defective	Replace
	Evaporator fan internal motor protector open	Section 7.14
	Heat relay defective	Check
	Heater termination thermostat open	Section 7.13
Unit will not heat or has insufficient heat	Heater(s) defective	Section 7.13
	Heater contactor or coil defective	Replace
	Evaporator fan motor(s) defective or running backwards	Section 7.14
	Evaporator fan motor contactor defective	Replace
	Controller malfunction	Section 6.9
	Defective wiring	Replace
	Loose terminal connections	Tighten
	Low line voltage	Section 3.3

6.5 Unit will not Terminate Heating

Condition	Possible Cause	Remedy / Reference
Unit fails to stop heating	Controller improperly set	Reset
	Controller malfunction	Section 6.9
	Heater termination thermostat remains closed along with the heat relay	Section 7.13

6.6 Unit will not Defrost Properly

Condition	Possible Cause	Remedy / Reference
Will not initiate defrost automatically	Defrost timer malfunction (Cd27)	Table 4–3
	Loose terminal connections	Tighten
	Defective wiring	Replace
	Defrost temperature sensor defective or heat termination thermostat open	Replace
	Heater contactor or coil defective	Replace
Will not initiate defrost manually	Keypad is defective	Replace
	Defrost temperature sensor open	Replace
Initiates but relay (DR) drops out	Low Line Voltage	Section 3.3
Initiates but does not defrost	Heater contactor or coil defective	Replace
	Heater(s) burned out	Section 7.13

6.7 Abnormal Pressures

Condition	Possible Cause	Remedy / Reference
High discharge pressure	Condenser coil dirty	Section 7.10.1
	Condenser fan rotating backwards	Section 7.11
	Condenser fan inoperative	Section 7.11
	Refrigerant overcharge or non-condensibles	Section 7.3
	Discharge service valve partially closed	Open
	Electronic expansion valve (EEV) control malfunction	Replace
Low suction pressure	Incorrect software and/or controller configuration	Check
	Failed suction pressure transducer (SPT) or evaporator pressure transducer (EPT)	Replace
	Suction service valve partially closed	Open
	Filter drier partially plugged	Section 7.12
	Low refrigerant charge	Section 7.3
	No evaporator air flow or restricted air flow	Section 7.13
	Excessive frost on evaporator coil	Section 6.6
	Evaporator fan(s) rotating backwards	Section 7.14.3
	EEV control malfunction	Replace
	Failed digital unloader valve (DUV)	Replace
Suction and discharge pressures tend to equalize when unit is operating	Compressor operating in reverse	Section 6.14
	Compressor cycling/stopped	Check
	Failed digital unloader valve (DUV)	Replace

6.8 Abnormal Noise or Vibrations

Condition	Possible Cause	Remedy / Reference
Compressor	Compressor start up after an extended shutdown	Normal
	Brief chattering when manually shut down	
	Compressor operating in reverse	**Section 6.14**
	Loose mounting bolts or worn resilient mounts	Tighten/Replace
	Loose upper mounting	**Section 7.8.1**
	Liquid slugging	**Section 7.13**
Condenser or Evaporator Fan	Bent, loose or striking venturi	Check
	Worn motor bearings	**Section 7.11**/ **Section 7.14**
	Bent motor shaft	**Section 7.11**/ **Section 7.14**

6.9 Microprocessor Malfunction

Condition	Possible Cause	Remedy / Reference
Will not control	Incorrect software and/or controller configuration	Check
	Defective sensor	**Section 7.25**
	Defective wiring	Check
	Low refrigerant charge	**Section 7.3**

6.10 No Evaporator Air Flow or Restricted Air Flow

Condition	Possible Cause	Remedy / Reference
Evaporator coil blocked	Frost on coil	**Section 6.6**
	Dirty coil	**Section 7.13**
No or partial evaporator air flow	Evaporator fan motor internal protector open	**Section 7.14**
	Evaporator fan motor(s) defective	**Section 7.14**
	Evaporator fan(s) loose or defective	**Section 7.14**
	Evaporator fan contactor defective	Replace

6.11 eAutoFresh Not Operating

Condition	Possible Cause	Remedy / Reference
Vent not opening	Unit not Configured for eAutoFresh Operation	No action
	Cd43 in Off mode	Section 5.4
	Wiring disconnected	Check wiring
	Stepper drive defective	Section 7.28
	Stepper motor defective	Section 7.28
	Unit operating in frozen mode	Section 5.4
Gas Limit mode unavailable	Check CO_2 sensor	Section 5.4
	Wiring disconnected	Check wiring
	Unit operating in frozen mode	Section 5.4
Unable to calibrate CO2 sensor	“Enter” Key not held for sufficient length of time	Section 5.4
	CO_2 outside of acceptable levels	Check
	Check CO_2 sensor	Section 5.4
Code 44 displays “-----”	Unit not Configured for eAutoFresh Operation	No action
	Check CO_2 sensor	Section 5.4

6.12 Electronic Expansion Valve Malfunction

Condition	Possible Cause	Remedy / Reference
Low suction pressure	Incorrect software and/or controller configuration	Check
	Failed suction pressure transducer (SPT) or evaporator pressure transducer (EPT)	Replace
	Suction service valve partially closed	Open
	Filter drier partially plugged	Section 7.12
	Low refrigerant charge	Section 7.3
	No evaporator air flow or restricted air flow	Section 7.13
	Excessive frost on evaporator coil	Section 6.6
	Evaporator fan(s) rotating backwards	Section 7.14.3
	EEV control malfunction	Section 7.16
	Failed digital unloader valve (DUV)	Replace
	Loose or insufficiently clamped sensor	Replace
High suction pressure with low superheat	Foreign material in valve	Section 7.16
	Failed suction pressure transducer (SPT) or evaporator pressure transducer (EPT)	Replace
	EEV control malfunction	Replace
	Improperly seated powerhead	Check seating
Liquid slugging in compressor	Failed suction pressure transducer (SPT) or evaporator pressure transducer (EPT)	Replace
	Failed EEV	Replace

6.13 Autotransformer Malfunction

Condition	Possible Cause	Remedy / Reference
Unit will not start	Circuit breaker (CB−1 or CB−2) tripped	Check
	Autotransformer defective	Section 7.24
	Power source not turned ON	Check
	460 VAC power plug is not inserted into the receptacle	Section 5.2.1

6.14 Compressor Operating in Reverse

Condition	Possible Cause	Remedy / Reference

NOTICE

The compressor may start in reverse for up to 10 seconds to determine correct phase rotation if required for phase detection.

⚠ CAUTION

Allowing the scroll compressor to operate in reverse for more than two minutes will result in internal compressor damage. Turn the start−stop switch OFF immediately.

Electrical	Incorrect wiring of compressor	Check
	Incorrect wiring of compressor contactor(s)	
	Incorrect wiring of current sensor	

6.15 Abnormal Temperatures

Condition	Possible Cause	Remedy / Reference
High discharge temperature	Refrigerant overcharge or non-condensibles	Section 7.3
	Discharge service valve partially closed	Open
	Electronic expansion valve (EEV) control malfunction	Section 7.16.1
	Failed suction pressure transducer (SPT) or evaporator pressure transducer (EPT)	Replace
	Discharge temperature sensor drifting high	Replace
	Failed economizer expansion valve, economizer coil, or economizer solenoid valve	Replace
	Plugged economizer expansion valve, economizer coil, or economizer solenoid valve	Replace
	Loose or insufficiently clamped sensor	Replace

6.16 Abnormal Currents

Condition	Possible Cause	Remedy / Reference
Unit reads abnormal currents	Current sensor wiring	Check

SECTION 7

SERVICE

NOTICE

Use a refrigerant recovery system whenever removing refrigerant. When working with refrigerants you must comply with all local government environmental laws. In the U.S.A., refer to EPA section 608.

⚠ WARNING

EXPLOSION HAZARD Failure to follow this WARNING can result in death, serious personal injury and / or property damage. Never use air or gas mixtures containing oxygen (O_2) for leak testing or operating the product. Charge only with R-134a: Refrigerant must conform to AHRI Standard 700 specification.

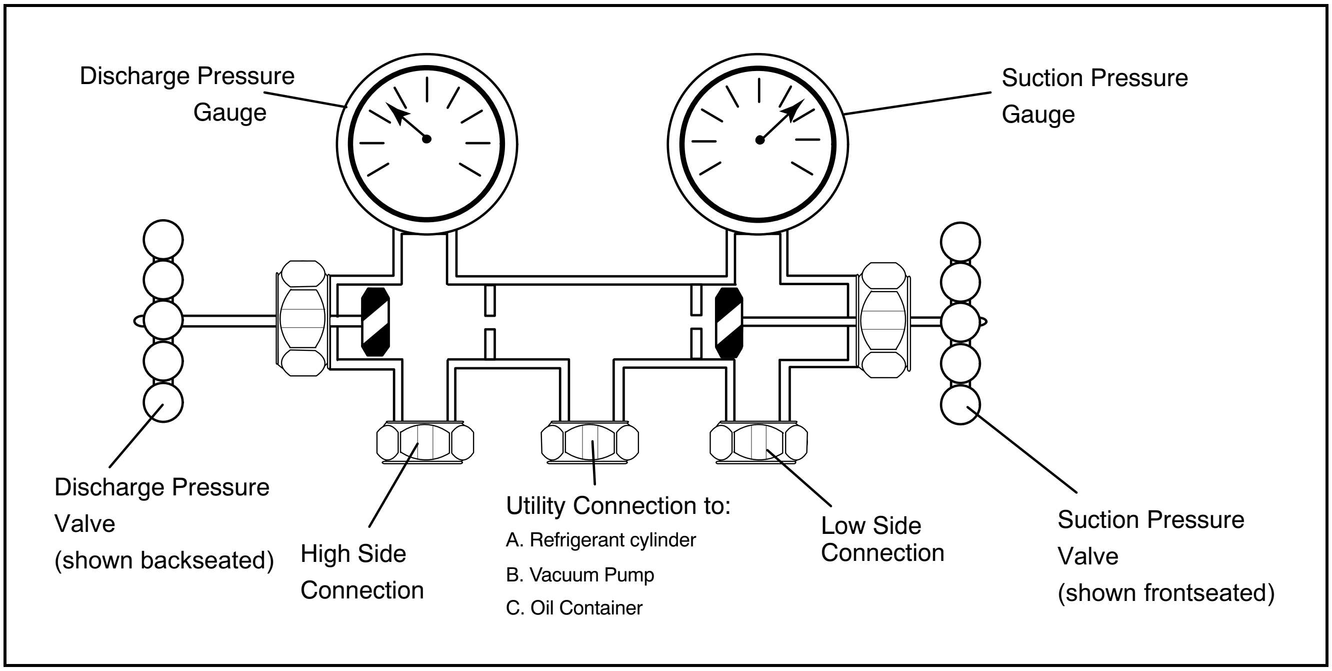
NOTE

Annual maintenance procedures for PrimeLINE units 69NT40-561 can be found in the **62-10327 Annual Maintenance Manual**, located in the Literature section of the Container Refrigeration website. To find the manual from the Literature section, click on Container Units > All Container Units > Operation.

7.1 Section Layout

Service procedures are provided herein beginning with refrigeration system service, then refrigeration system component service, electrical system service, temperature recorder service and general service. Refer to the Table of Contents to locate specific topics.

Figure 7.1 Manifold Gauge Set



7.2 Manifold Gauge Set

The manifold gauge set (see **Figure 7.1**) is used to determine system operating pressure, add refrigerant charge, and to equalize or evacuate the system.

When the Suction Pressure Valve is frontseated (turned all the way in), the suction (low) pressure can be checked at the Suction Pressure Gauge.

When the Discharge Pressure Valve is frontseated, the discharge (high) pressure can be checked at the Discharge Pressure Gauge.

When both valves are backseated (all the way out), high pressure vapor will flow into the low side.

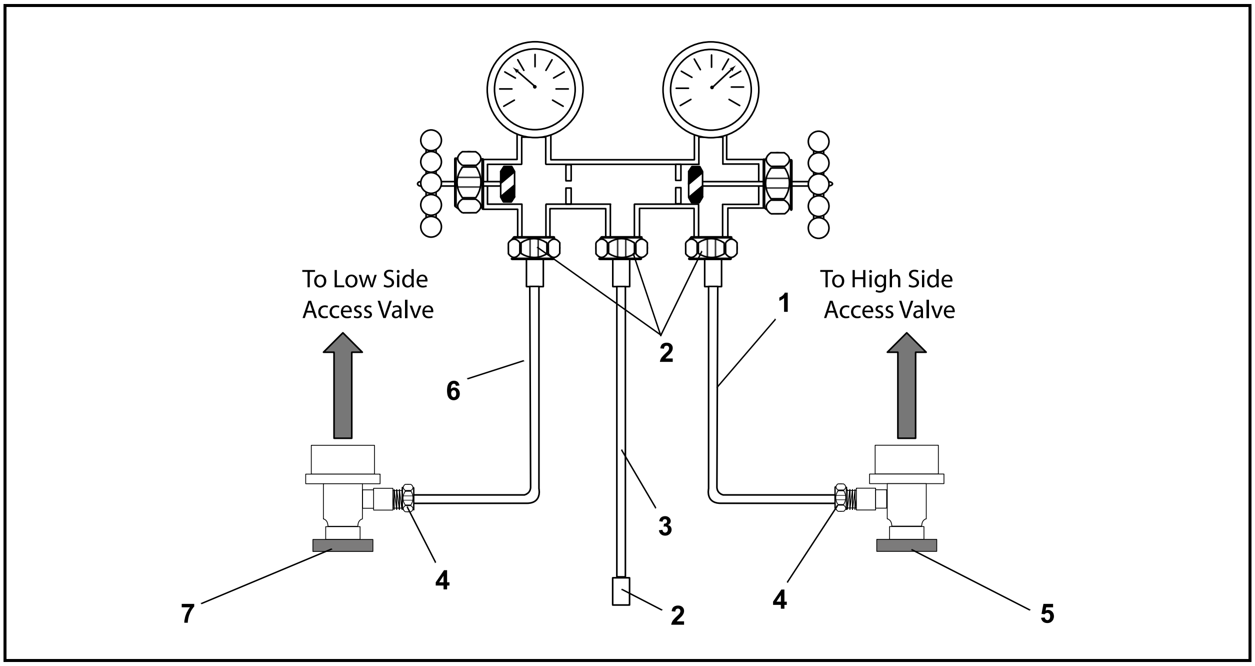
When the Suction Pressure Valve is open and the Discharge Pressure Valve shut, the system can be charged through the Utility Connection. Oil can also be added to the system.

A R-134a manifold gauge/hose set with self-sealing hoses (see **Figure 7.2**) is required for service of the models covered within this manual. The manifold gauge/hose set is available from Carrier Transicold. (Carrier Transicold part number 07-00294-00, which includes items 1 through 6, **Figure 7.2**.)

If the manifold gauge/hose set is new or was exposed to the atmosphere, it will need to be evacuated to remove contaminants and air as follows:

1. Backseat (turn counterclockwise) both field service couplings (see **Figure 7.2**) and midseat both hand valves.
2. Connect the yellow hose to a vacuum pump and refrigerant 134a cylinder.
3. Evacuate to 10 inches of vacuum and then charge with R-134a to a slightly positive pressure of 0.1 kg/cm^2 (1.0 psig).
4. Frontseat both manifold gauge set valves and disconnect from cylinder. The gauge set is now ready for use.

Figure 7.2 Manifold Gauge/Hose Set



1. RED Refrigeration and/or Evacuation Hose (SAE J2196/R-134a)
2. Hose Fitting (0.5-16 Acme)
3. YELLOW Refrigeration and/or Evacuation Hose (SAE J2196/R-134a)
4. Hose Fitting with O-ring (M14 x 1.5)
5. High Side Field Service Coupling (Red Knob)
6. BLUE Refrigeration and/or Evacuation Hose (SAE J2196/R-134a)
7. Low Side Field Service Coupling (Blue Knob)

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7.3 Service Connections

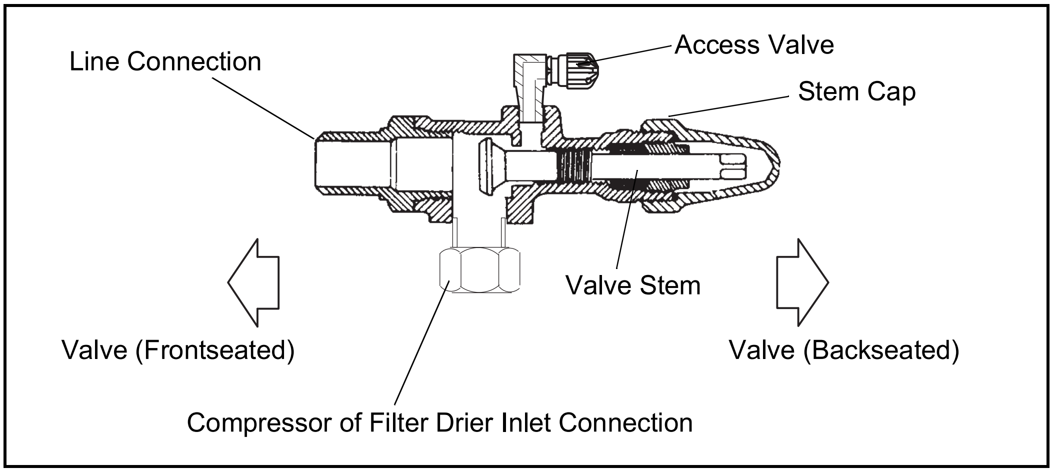
The compressor suction, compressor discharge, and the liquid line service valves (see **Figure 7.3**) are provided with a double seat and an access valve which enables servicing of the compressor and refrigerant lines.

Turning the valve stem clockwise (all the way forward) will frontseat the valve to close off the line connection and open a path to the access valve. Turning the stem counterclockwise (all the way out) will backseat the valve to open the line connection and close off the path to the access valve.

With the valve stem midway between frontseat and backseat, both of the service valve connections are open to the access valve path.

For example, the valve stem is first fully backseated when connecting a manifold gauge to measure pressure. Then, the valve is opened 1/4 to 1/2 turn to measure the pressure.

Figure 7.3 Service Valve



Connection of the manifold gauge/hose set (see **Figure 7.4**) is dependent on the component being serviced. If only the compressor is being serviced, the high side coupling is connected to the discharge service valve.

For service of the low side (after pump down), the high side coupling is connected to the liquid line service valve. The center hose connection is brought to the tool being used (vacuum, tank, etc.).

Connecting the manifold gauge set:

1. Remove service valve stem cap and to make sure the valve is backseated.
2. Remove access valve cap (See **Figure 7.3**).
3. Connect the field service coupling (see **Figure 7.2**) to the access valve.
4. Turn the field service coupling knob clockwise, which will open the system to the gauge set.
5. To read system pressures, slightly midseat the service valve.
6. Repeat the procedure to connect the other side of the gauge set.

⚠ CAUTION

To prevent trapping liquid refrigerant in the manifold gauge set be sure set is brought to suction pressure before disconnecting.

Removing the Manifold Gauge Set:

1. While the compressor is still ON, backseat the high side service valve.
2. Midseat both hand valves on the manifold gauge set and allow the pressure in the manifold gauge set to be drawn down to low side pressure. This returns any liquid that may be in the high side hose to the system.
3. Backseat the low side service valve. Backseat both field service couplings and frontseat both manifold hand valves. Remove couplings from access valves.
4. Install both service valve stem caps and service port caps (finger-tight only).

7.4 Pump Down the Unit

To service the filter drier, economizer, expansion valves, economizer solenoid valve, digital loader valve, digital unloader valve or evaporator coil, pump the refrigerant into the high side as follows:

⚠ CAUTION

The scroll compressor achieves low suction pressure very quickly. Do not use the compressor to evacuate the system below 0 psig. Never operate the compressor with the suction or discharge service valves closed (frontseated). Internal damage will result from operating the compressor in a deep vacuum.

Automatic Pump Down:

To perform an Automatic Pump Down using Cd59 Pump Down Logic, refer to **Table 4–3** Controller Function Codes.

Manual Pump Down:

1. Attach manifold gauge set to the compressor suction and discharge service valves. Refer to paragraph 6.2.
2. Start the unit and run in the frozen mode (controller set below -10C (14F) for 10 to 15 minutes.
3. Check function code Cd21 (refer to **Section 4.2.2**). The economizer solenoid valve should be open. If not, continue to run until the valve opens.
4. Frontseat the liquid line service valve. Place Start-Stop switch in the OFF position when the suction reaches a positive pressure of 0.1 bar (1.4 psig).
5. Frontseat the suction and discharge service valves. The refrigerant will be trapped between the compressor discharge service valves and the liquid line valve.
6. Before opening up any part of the system, a slight positive pressure should be indicated on the pressure gauge. Remove power from the unit before opening any part of the system. If a vacuum is indicated, emit refrigerant by cracking the liquid line valve momentarily to build up a slight positive pressure.
7. When opening up the refrigerant system, certain parts may frost. Allow the part to warm to ambient temperature before dismantling. This avoids internal condensation which puts moisture in the system.
8. After repairs have been made, be sure to perform a refrigerant leak check (refer to **Section 7.5**), and evacuate and dehydrate the low side (refer to **Section 7.6.1**).
9. Check refrigerant charge (refer to **Section 7.7**).

7.5 Refrigerant Leak Checking

⚠ WARNING

EXPLOSION HAZARD Failure to follow this WARNING can result in death, serious personal injury and / or property damage.

Never use air or gas mixtures containing oxygen (O2) for leak testing or operating the product.

Charge only with R-134a: Refrigerant must conform to AHRI Standard 700 specification.

1. The recommended procedure for finding leaks in a system is with a R-134a electronic leak detector. Testing joints with soapsuds is satisfactory only for locating large leaks.
2. If the system is without refrigerant, charge the system with refrigerant 134a to build up pressure between 2.1 to 3.5 bar (30.5 to 50.8 psig). To ensure complete pressurization of the system, refrigerant should be charged at the compressor suction valve and the liquid line service valve. Remove refrigerant cylinder and leak-check all connections.

NOTICE

Only refrigerant 134a should be used to pressurize the system. Any other gas or vapor will contaminate the system, which will require additional purging and evacuation of the system.

3. If required, remove refrigerant using a refrigerant recovery system and repair any leaks. Check for leaks.

4. Evacuate and dehydrate the unit. (Refer to **Section 7.6**.)
5. Charge unit per **Section 7.7.1**.

7.6 Evacuation and Dehydration

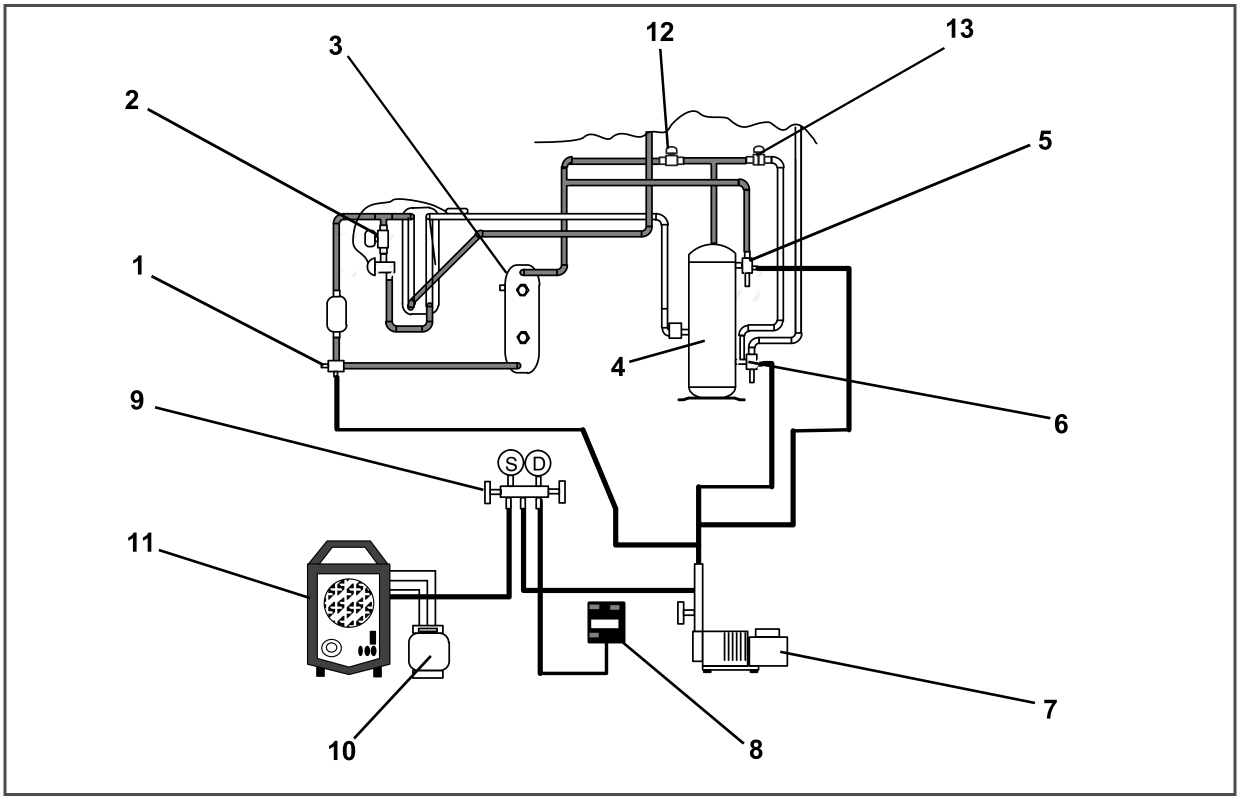
7.6.1 General

Moisture is detrimental to refrigeration systems. The presence of moisture in a refrigeration system can have many undesirable effects. The most common are copper plating, acid sludge formation, "freezing-up" of metering devices by free water, and formation of acids, resulting in metal corrosion.

7.6.2 Preparation

1. Evacuate and dehydrate only after pressure leak test (refer to **Section 7.6**).
2. Essential tools to properly evacuate and dehydrate any system include a vacuum pump (8 m3/hr = 5 cfm volume displacement) and an electronic vacuum gauge. The pump is available from Carrier Transicold, P/N 07-00176-11. The magnet is P/N 07-00512-00. The micron gauge is P/N 07-00414-00.
3. If possible, keep the ambient temperature above 15.6°C (60°F) to speed evaporation of moisture. If the ambient temperature is lower than 15.6°C (60°F), ice might form before moisture removal is complete. Heat lamps or alternate sources of heat may be used to raise the system temperature.
4. Additional time may be saved during a complete system pump down by replacing the filter drier with a section of copper tubing and the appropriate fittings. Installation of a new drier may be performed during the charging procedure.

Figure 7.4 Refrigeration System Service Connections



1. Liquid Service Connection
2. Economizer Solenoid Valve
3. Receiver or Water Cooled Condenser
4. Compressor
5. Discharge Service Connection
6. Suction Service Connection
7. Vacuum Pump
8. Electronic Vacuum Gauge
9. Manifold Gauge Set
10. Refrigerant Cylinder
11. Reclaimer
12. Discharge Loader Valve
13. Discharge Unloader Valve

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7.6.3 Complete System

NOTICE

Refer to Partial System procedure for information pertaining to partial system evacuation and dehydration.

1. Remove all refrigerant using a refrigerant recovery system.
2. The recommended method to evacuate and dehydrate the system is to connect evacuation hoses at the compressor discharge and suction and liquid line service valve (see **Figure 7.4**). Be sure the service hoses are suited for evacuation purposes.

NOTICE

To prevent the area between the Economizer Solenoid Valve (ESV) and the Compressor from being isolated during evacuation, it is necessary to open the ESV using a magnet tool, Carrier Transicold part number 07-00512-00.

To prevent the area between the DUV and the Compressor from being isolated during evacuation, it is necessary to open the DUV using a magnet tool, Carrier Transicold part number 07-00512-00.

3. Remove the ESV and DUV coils from the valve bodies. Place the magnet tool over the valve stem, an audible click will be heard when the ESV opens.

NOTICE

Make sure to replace the valve coils before restating the unit. Starting the unit with the coil removed from the valve will burn out the coil.

4. Test the evacuation setup for leaks by backseating the unit service valves and drawing a deep vacuum with the vacuum pump and gauge valves open. Shut off the pump and check to see if the vacuum holds. Repair leaks if necessary.
5. Midseat the refrigerant system service valves.
6. Open the vacuum pump and electronic vacuum gauge valves, if they are not already open. Start the vacuum pump. Evacuate unit until the electronic vacuum gauge indicates 2000 microns. Close the electronic vacuum gauge and vacuum pump valves. Shut off the vacuum pump. Wait a few minutes to be sure the vacuum holds.
7. Break the vacuum with either clean dry refrigerant 134a or dry nitrogen. Raise system pressure to roughly 0.14 bar (2 psig), monitoring it with the compound gauge.
8. If R134a was used, remove refrigerant using a refrigerant recovery system. If nitrogen was used, relieve the pressure.
9. Repeat steps 6 and 7 one time.
10. Remove the copper tubing and change the filter drier. Evacuate unit to 500 microns. Close the electronic vacuum gauge and vacuum pump valves. Shut off the vacuum pump. Wait five minutes to see if vacuum holds. This procedure checks for residual moisture and/or leaks.
11. With a vacuum still in the unit, the refrigerant charge may be drawn into the system from a refrigerant container on weight scales.

7.6.4 Partial System

1. If refrigerant charge has been removed from the low side only, evacuate the low side by connecting the evacuation set-up at the compressor suction valve and the liquid service valve but leave the service valves frontseated until evacuation is completed.
2. Once evacuation has been completed and the pump has been isolated, fully backseat the service valves to isolate the service connections and then continue with checking and, if required, adding refrigerant in accordance with normal procedures.

7.7 Refrigerant Charge

⚠ **WARNING**

EXPLOSION HAZARD Failure to follow this WARNING can result in death, serious personal injury and / or property damage.

Never use air or gases containing oxygen (O2) for leak testing or operating the product.

Charge only with R-134a: Refrigerant must conform to AHRI Standard 700 specification.

7.7.1 Checking the Refrigerant Charge

NOTICE

Use a refrigerant recovery system whenever removing refrigerant. When working with refrigerants you must comply with all local government environmental laws. In the U.S.A., refer to EPA Section 608.

1. Connect the gauge manifold to the compressor discharge and suction service valves. For units operating on a water cooled condenser, change over to air cooled operation.
2. Bring the container temperature to approximately 0°C (32°F) or below. Then set the controller set point to -25°C (-13°F).
3. Partially block the condenser coil inlet air. If covering the lower portion of the coil is not sufficient, remove the left hand infill panel and cover the left side of the coil. Increase the area blocked until the compressor discharge pressure is raised to approximately 12.8 bar (185 psig).
4. On units equipped with a receiver, the level should be between the glasses. On units equipped with a water-cooled condenser, the level should be at the center of the glass. If the refrigerant level is not correct, continue with the following paragraphs to add or remove refrigerant as required.

7.7.2 Adding Refrigerant to System (Full Charge)

1. Evacuate unit and leave in deep vacuum. (Refer to **Section 7.6**.)
2. Place cylinder of R-134a on scale and connect charging line from cylinder to liquid line valve. Purge charging line at liquid line valve and then note weight of cylinder and refrigerant.
3. Open liquid valve on cylinder. Open liquid line valve half-way and allow liquid refrigerant to flow into the unit until the correct weight of refrigerant (refer to **Section 3.2**) has been added as indicated by scales.

NOTICE

It may be necessary to finish charging unit through suction service valve in gas form, due to pressure rise in high side of the system.

4. Backseat manual liquid line valve (to close off gauge port). Close liquid valve on cylinder.
5. Start unit in cooling mode. Run for approximately 10 minutes and check the refrigerant charge.

7.7.3 Adding Refrigerant to System (Partial Charge)

1. Examine refrigerant system for any evidence of leaks, repair as necessary. (Refer to **Section 7.5**.).
2. Maintain the conditions outlined in **Section 7.7.1**.
3. Fully backseat the suction service valve and remove the service port cap.
4. Connect charging line between suction service valve port and cylinder of refrigerant R-134a. Open VAPOR valve.
5. Partially frontseat (turn clockwise) the suction service valve and slowly add charge until the refrigerant appears at the proper level. Be careful not to frontseat the suction valve fully, if the compressor is operated in a vacuum, internal damage may result.

7.8 Compressor

⚠ WARNING

Make sure power to the unit is OFF and power plug disconnected before replacing the compressor.

⚠ WARNING

Before disassembly of the compressor, be sure to relieve the internal pressure very carefully by slightly loosening the couplings to break the seal.

⚠ CAUTION

The scroll compressor achieves low suction pressure very quickly. Do not use the compressor to evacuate the system below 0 psig. Never operate the compressor with the suction or discharge service valves closed (frontseated). Internal damage will result from operating the compressor in a deep vacuum.

⚠ CAUTION

The PrimeLINE unit has a hermetically sealed compressor that should not be opened and/or repaired. Doing so can cause a loss in performance and premature system failure due to the precision machinery and assembly required within the compressor. To repair the unit, remove the faulty compressor and replace with an approved Carrier compressor. If the return of the compressor is not required, follow local waste collection & recycling regulations in discarding the compressor.

NOTICE

Replacement compressors are supplied without oil.

7.8.1 Removal and Replacement of Compressor

1. Turn the unit start-stop switch (ST) and unit circuit breaker (CB-1) OFF, and disconnect power to the unit. Follow the regional lock out tag out procedure for electrical system.
2. Remove the compressor guard and install R134a manifold gauges on the compressor suction and discharge service valves.
3. Remove the Digital Un-loader (DUV) coil and place the magnet on the valve stem to open the coil. Leave magnet on the coil. If a magnet is not available perform the Jumper procedure:
    a. Remove all 4 controller fuses (F1, F2, F3a, F3b).
    b. Remove the KA6 wire from KA controller connector on the front of the controller.
    c. Disconnect the X1 wire from the 24VAC side of transformer (black wire) and locate it away for the transformer.
    d. Jumper between the black transformer wire to the KA6 wire removed from the connector.
    e. Connect power to unit and turn circuit breaker on (DUV coil is now energized).
4. Connect a refrigerant recovery machine and and recover any refrigerant out of the compressors and DUV line following the recovery machine recommendations (refer to the recovery machines Operation and Service manual for proper procedures).
5. If a jumper was used in step c, on completion of the recovery turn the circuit breaker off and disconnect the power. Follow the regional lock out tag out procedure for electrical system.

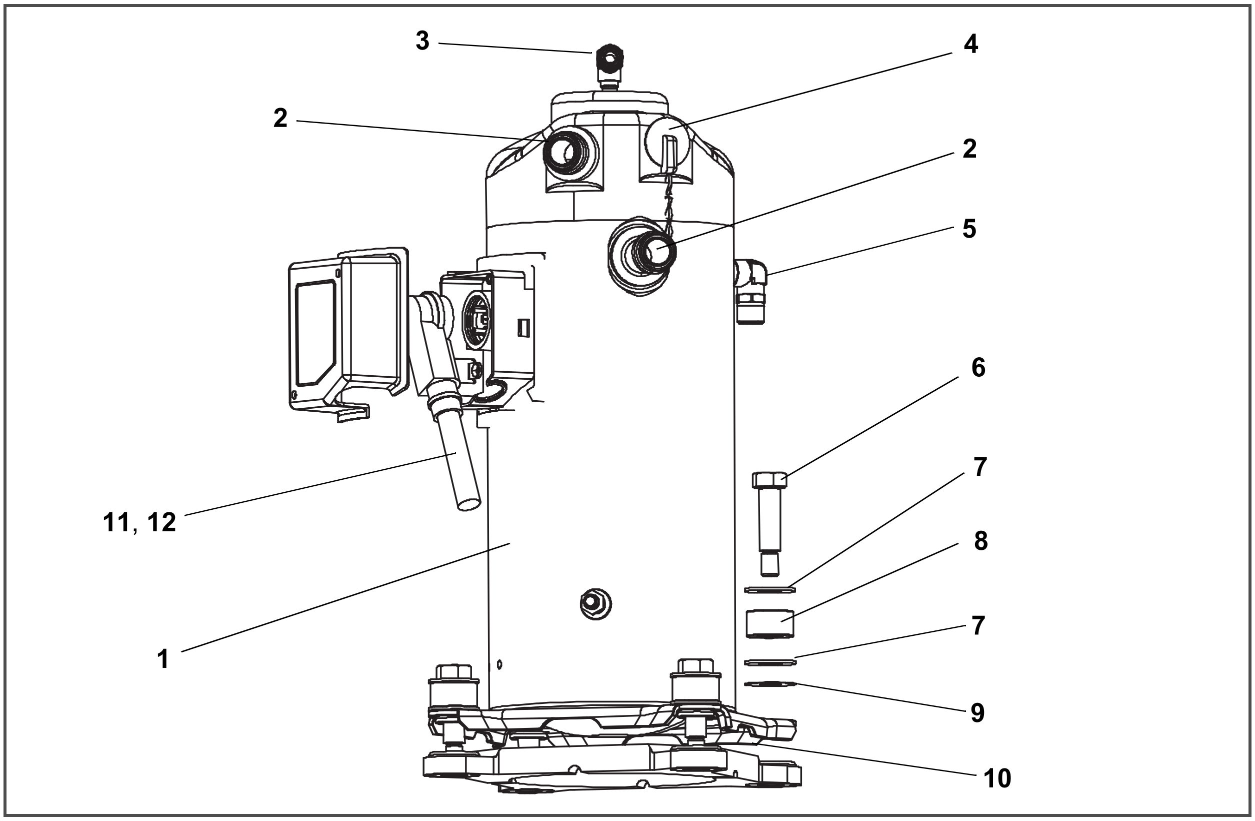
6. Remove the compressor terminal cover, disconnect the ground wire and remove (pull) the cable plug from the compressor terminals. Install the terminal cover back after removing the power cable.

NOTICE

Inspect the power cable (plug) terminals to ensure they are not deformed or have any signs of heat or arcing. If any damage is noted replace the power cable.

7. Remove the rotalock fittings from the suction and discharge service connections, and uncouple the unloader and economizer lines from the compressor.
8. Cut the dome temperature sensor wires. The replacement compressor comes with a dome temperature sensor already assembled.
9. Remove and save the compressor base-mounting screws. Discard the resilient mounts and washers.
10. Remove (slide out) the old compressor from the unit tagging it with unit information and reason for replacement.
11. Wire tie the compressor base plate with the wire ties (Figure 7.5, item # 10) to the compressor, and slide the new compressor in the unit. You may need to slightly tilt the compressor back.
DO NOT add any oil to the replacement compressor. Replacement compressor is shipped with full oil charge of 60 oz.
12. Cut and discard the wire ties that were used to hold the base plate to the compressor.

Figure 7.5 Compressor Kit



1. Compressor
2. Teflon Seal for Valve Connection (2)
3. O-Ring (Unloader Connection)
4. Compressor Discharge Temperature Sensor
5. O-Ring (Economizer Connection)
6. Base Mounting Bolts
7. SST Washers
8. Resilient Mount
9. Mylar Washers
10. Wire Ties
11. Power Cable Gasket
12. Ground Connection Screw
13. Power Cable Lubricant - Krytox (Not Shown)

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13. Put the new SST washers (**Figure 7.5**, item # 7) on each side of the resilient mounts (**Figure 7.5**, item #8), and the new mylar washer (**Figure 7.5**, item # 9) on the bottom of it as shown in **Figure 7.7**. Install the four base-mounting screws loosely.

14. Place the new teflon seals (**Figure 7.5**, item # 2) at the compressor suction and discharge ports as well as the O-rings (**Figure 7.5**, items #3 and #5) at the unloader and economizer line connection ports. Lubricate the O-rings and the shoulder of the ORS fittings for the unloader and economizer ports. Hand tight all four connections.

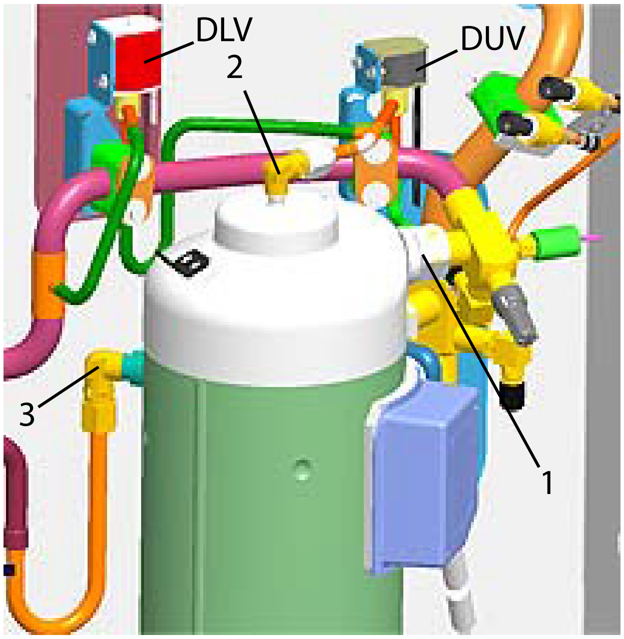
15. Torque the four base-mounting screws (**Figure 7.5**, item #6) to 6.2 mkg (45 ft-lbs.).

16. Torque the compressor ports / connections to the following values. (Refer to **Figure 7.6** for locations)

:

Service Valve / Connection	Torque Value
Suction and Discharge Rotalocks	108.5 to 135.5 Nm (80 to 100 ft-lbs.)
Unloader connection	24.5 to 27 Nm (18 to 20 ft-lbs.)
Economized connection	32.5 to 35 Nm (24 to 26 ft-lbs.)

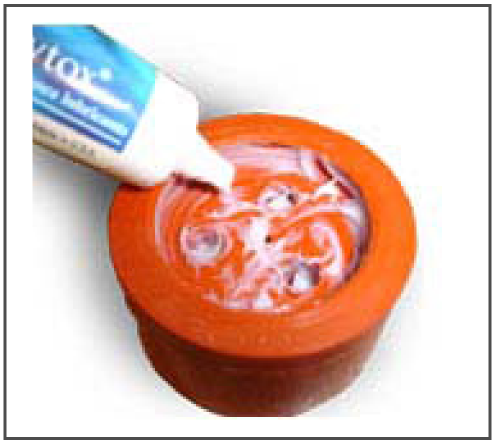
Figure 7.6 Compressor Ports / Connections



17. Connect the new compressor dome temperature sensor with the old sensor wires removed in step i using butt-splices and heat shrinks. Wire-tie any loose wiring as appropriate.

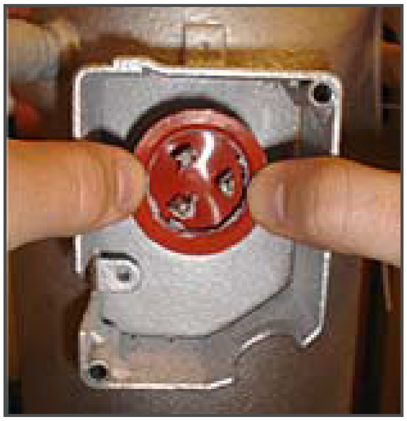
18. Open the compressor terminal cover and connect the compressor power cable following the steps below:
    a. Liberally coat the orange gasket (**Figure 7.5**, item #11) surfaces with the Krytox lubricant (**Figure 7.5**, item #13) as shown in **Figure 7.7**.

Figure 7.7 Lubricating Orange Gasket



b. Install the orange gasket part onto the compressor fusite with the grooved or threaded side out as shown in **Figure 7.8**. Ensure that the gasket is seated onto the fusite base.

Figure 7.8 Installing Orange Gasket



c. Coat the inside of the power plug (female) connector pins with the Krytox lubricant (**Figure 7.5**, item #13), and Insert the plug onto the compressor terminal connections. Make sure, the orange gasket has bottomed out onto the fusite and it fits securely onto the terminal pins while fully inserted into the orange plug as shown in **Figure 7.9** and **Figure 7.10**.

Figure 7.9 Power Plug Connection

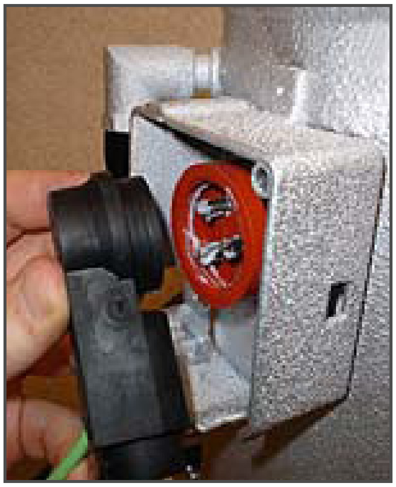
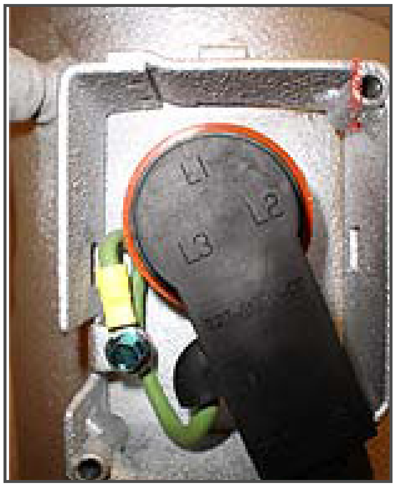


Figure 7.10 Power Plug Secured



19. Connect the green ground wire (**Figure 7.10** above) to the grounding tab located inside the terminal box of the compressor using the self tapping grounding screw (**Figure 7.5**, item #12). Close the compressor terminal box using the terminal cover removed.

20. Evacuate the compressor to 1000 microns (refer to the Operation and Service manual for proper procedures).
    If jumper procedure was used in step c, reconnect unit to power and turn on the circuit breaker to again power the DUV.
21. On completion of the vacuum, remove the magnet and reinstall the DUV coil.
    If a jumper was used, turn off the circuit breaker and disconnect power. Reconnect the X1 wire to the black transformer wire. Reinstall and secure the KA6 wire to the KA plug at the controller.
22. Mid seat service valves, connect power to the unit; turn the unit ON and run it in full cool mode for 10 minutes.
23. Initiate code select 59 (unit pump down).
    Choosing code select 59, the user will be advised to close (front seat) the Liquid Line Valve (king valve). The display will flash “CLOSE LLV” and “PrESS EntEr.” Upon closing the valve, select the enter key. Pump down “PdN” will display on the left with the suction pressure on the right. Upon completion of the pump down the display will flash between “PdN”“DOnE” and “SHUT OFF.”
24. Front seat the suction and discharge service valve and replace the filter drier.
25. Evacuate the suction side and compressor to 1000 microns.
26. Backseat all service valves, and run in full cool.
27. Verify refrigerant charge level per the unit s operation/service manual.
28. Perform a leak check of the system.
29. Replace any removed wire tie wraps and reinstall compressor guard.
30. If failure occurs under the unit’s warranty, tag the replacement part for cause of failure and collect an all data download for failure analysis.

7.9 High Pressure Switch

7.9.1 Checking High Pressure Switch

⚠ **WARNING**

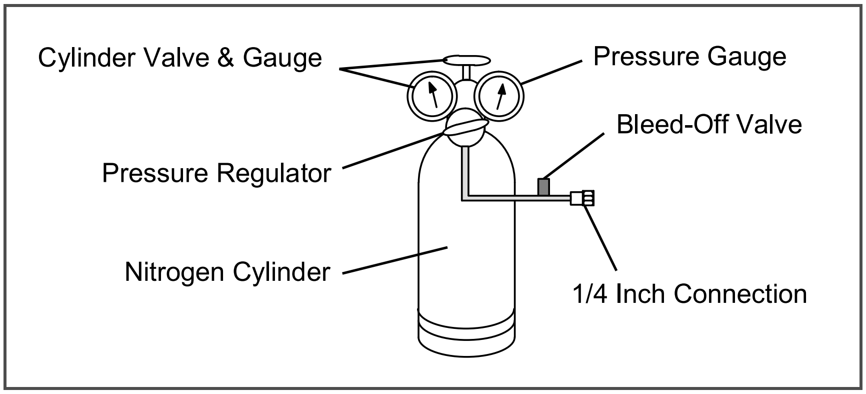
Do not use a nitrogen cylinder without a pressure regulator.

NOTICE

The high pressure switch is non-adjustable.

1. Remove switch as outlined in **Figure 7.9.2**.
2. Connect ohmmeter or continuity light across switch terminals. Ohm meter will indicate no resistance or continuity light will be illuminated if the switch closed after relieving compressor pressure.
3. Connect hose to a cylinder of dry nitrogen. (See **Figure 7.11**)

Figure 7.11 High Pressure Switch Testing



4. Set nitrogen pressure regulator at 26.4 kg/cm^2 (375 psig) with bleed-off valve closed.
5. Close valve on cylinder and open bleed-off valve.
6. Open cylinder valve. Slowly close bleed-off valve to increase pressure on switch. The switch should open at a static pressure up to 25 kg/cm2 (350 psig). If a light is used, the light will go out. If an ohmmeter is used, the meter will indicate open circuit.
7. Slowly open bleed-off valve to decrease the pressure. The switch should close at 18 kg/cm^2 (250 psig).

7.9.2 Replacing High Pressure Switch

1. Remove the refrigerant charge.
2. Disconnect wiring from defective switch. The high pressure switch is located on the discharge connection or line and is removed by turning counterclockwise.
3. Install a new high pressure switch after verifying switch settings.
4. Evacuate, dehydrate and recharge the system.
5. Start the unit, verify refrigeration charge and oil level.

7.10 Condenser Coil

The condenser coil consists of a series of parallel copper tubes expanded into copper fins and formed into a “C” shape with the fourth side of the square formed by the side support bracket.

7.10.1 Condenser Coil Cleaning

To ensure optimal efficiency of the unit the condenser coil must be clean. The condenser coil should be cleaned at least once a year, but more frequent cleaning may be required depending on operating conditions. The coil is cleaned with fresh water sprayed in the reverse direction of the air flow to remove any debris from the coil. A high pressure washer is not required, mains water pressure is sufficient. To clean the condenser coil perform the following procedure:

⚠ WARNING

Do not remove the condenser fan grille before turning power OFF and disconnecting the power plug.

1. Make sure the unit is powered off and the plug is disconnected.
2. Remove the condenser fan grille.
3. Starting from the top of the coil, use a water hose with a nozzle to wash the coil from the inside out.
4. Systematically wash across the inside top face of the coil until the water runs clean.
5. Wash down the center section, and then through the bottom of the coil, continue washing until the water runs clear.
6. After the coil is clean, rinse the condenser fan to remove any dirt build up from the blades.
7. Replace the condenser fan grille ensuring that it is centered around the fan.

7.10.2 Condenser Coil Removal

1. Using a refrigerant reclaim system remove the refrigerant charge.

⚠ **WARNING**

Do not remove the condenser fan grille before turning power OFF and disconnecting the power plug.

2. Remove the condenser fan grille, retain all bolts and washers for reuse.
3. Remove the condenser fan.
4. Remove the infill panels to the left and right of the condenser fan shroud.
5. Remove the condenser fan shroud.
6. Unplug the condenser fan motor.
7. Remove and retain sufficient putty from around the motor wire harness to allow the harness to be slid back through the side support bracket.
8. Cut the top and bottom drain lines midway between the side support bracket and the first cable tie, approx 150mm (6”) from the side support bracket.
9. Remove and retain sufficient putty from around the drain lines to allow the tubes to be slid back through the side support bracket.
10. Remove filter drier.
11. Unbraze the inlet connection to coil.
12. Remove the cushion clamps securing the liquid line to the top and bottom receiver brackets, retain all clamps and securing hardware.
13. Place a support under the condenser coil before releasing the coil from the frame.
14. Remove the lower mounting bracket bolts from the inside of the coil.
15. Remove the top mounting bracket bolts and grille extension mount from inside the coil.
16. Remove the side support bracket mounting bolts.
17. Slide the condenser assembly with receiver out of the unit.

7.10.3 Condenser Coil Preparation

Before installing the new condenser coil, the receiver assembly and mounting hardware must be removed from the old coil assembly:

1. From the old coil, unbolt the receiver assembly from side support bracket.
2. Unbraze the receiver assembly from the coil outlet line and remove from the coil assembly.
3. Unbolt the side support bracket from the top and bottom coil supports and remove from old coil.
4. Refit the side support bracket to the new coil ensuring that the top and bottom are flush mounted with the coil support.

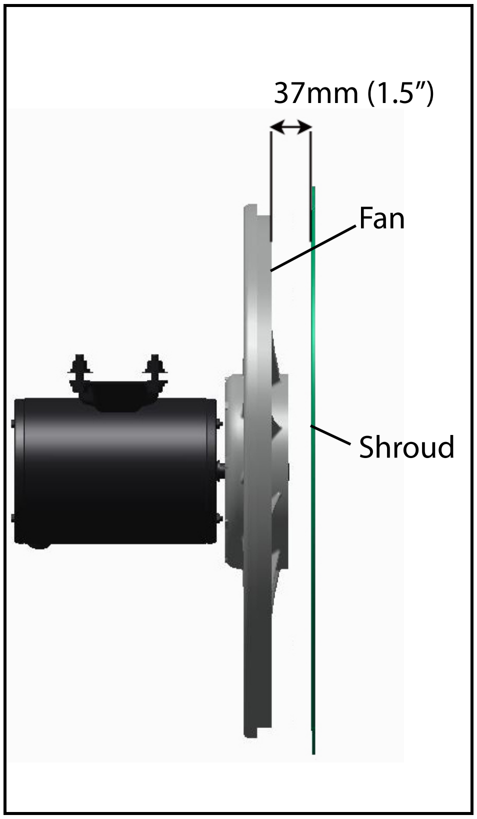
7.10.4 Condenser Coil Installation

Once the side support bracket has been secured to the new condenser coil, the entire assembly is ready to be installed into the unit:

1. Slide the new condenser coil into place ensuring the coil inlet connection is mated to the pipework and that the coil is fully supported.
2. Secure the condenser coil into the unit using the retained hardware; refit the mylar and fender washers:
    a. Refit the side support bracket bolts.
    b. Refit the top support bracket bolts as well as the top grille extension support.
    c. Refit the bottom support bracket bolts.

3. Braze the condenser coil inlet connection.
4. Insert the receiver pipe work onto the coil outlet and loosely secure the receiver assembly to the side support bracket with the retained hardware.
5. Braze the outlet connection to the receiver assembly.
6. Install a new filter drier.
7. Replace the liquid line cushion clamps.
8. Secure the receiver assembly to the side support bracket.
9. Pressure / leak test the coil and filter drier connections, refer to **Section 7.5**.
10. Evacuate the entire unit, refer to **Section 7.6**.
11. Slide the top and bottom drain lines back into place through the side support bracket.
12. Using the two supplied straight connectors and contact adhesive reconnect the drain lines.
13. Slide the condenser fan motor wiring harness back through the side support bracket and refit to condenser motor.
14. Replace all wire ties that were removed to properly secure the drain line and wiring.
15. Reseal the wire harness and drain line penetrations with the putty.
16. Slide the condenser fan onto the motor shaft reversed but do not secure.
17. Refit the condenser fan shroud to the unit. Use the condenser fan as a guide to ensure the shroud is properly centered around the fan.
18. Remove the condenser fan, and place it on the shaft facing the correct direction. Adjust the fan to the correct position, 37mm (1.5”) from the fan shroud, see **Figure 7.12**.

Figure 7.12 Condenser Fan Position



19. Use Loctite “H” on the fan set screws, and tighten.
20. Refit left and right infill panels.

21. Refit the condenser fan grille, ensuring the grille is properly centered around the condenser fan.
22. Evacuate the entire unit, refer to **Section 7.6**.
23. Recharge the unit with the charge shown on the unit serial plate, refer to **Section 7.7**. It is important for proper unit operation that the charge is weighed into the unit.

7.11 Condenser Fan and Fan Motor

The condenser fan rotates counter-clockwise (viewed from front of unit). The fan pulls air through the condenser coil, and discharges the air horizontally through the front of the unit.

7.11.1 Condenser Fan Motor Remove/Replace

⚠ WARNING

Do not remove the condenser fan grille before turning power OFF and disconnecting the power plug.

1. Remove the condenser fan grille, retain all bolts and washers for reuse.
2. Remove the condenser fan by loosening the two set screws.
3. Disconnect the condenser fan motor wiring.

⚠ CAUTION

Take necessary steps (place plywood over coil or use sling on motor) to prevent motor from falling into condenser coil.

4. Note the number of shims on each side of the motor as the same configuration will be required to refit the new motor.
5. Remove the fan motor mounting hardware and remove motor.
6. Loosely mount the new motor using new lock nuts.
7. Connect the fan motor wiring to the new fan motor.
8. Replace the shims in the same configuration as they were removed.
9. Tighten the fan motor mounting bolts to properly secure the motor.
10. To make sure that the motor is aligned properly, slide the condenser fan onto the motor shaft reversed but do not secure.
11. Rotate the fan to make sure the fan blades do not contact the shroud:
    a. If the fan motor is misaligned vertically, add or remove shims to align.
    b. If the fan motor is not properly centered, loosen the mounting bolts, and adjust the motor position on the bracket, and then secure the motor.
12. Remove the condenser fan, and connect the fan motor wiring to the fan motor.
13. Place the condenser fan on the shaft facing the correct direction. Adjust the fan to the correct position, 37mm (1.5”) from the fan shroud, see **Figure 7.12**.
14. Use Loctite “H” on the fan set screws, and tighten.
15. Refit the left and right infill panels.
16. Refit the condenser fan grille, ensuring the grille is properly centered around condenser fan.

7.12 Filter Drier

To check filter drier:

1. Test for a restricted or plugged filter drier by feeling the liquid line inlet and outlet connections. If the outlet side feels cooler than the inlet side, then the filter drier should be changed.
2. Check the moisture-liquid indicator if the indicator shows a high level of moisture, the filter drier should be replaced.

To replace filter drier:

1. Pump down the unit (refer to **Section 7.4**). Evacuate if unit is not equipped with service valves. Then replace filter drier.
2. Evacuate the low side in accordance with **Section 7.6**.
3. After unit is in operation, inspect for moisture in system and check charge.

7.13 Evaporator Coil & Heater Assembly

The evaporator section, including the evaporator coil, should be cleaned regularly. The preferred cleaning fluid is fresh water or steam. Another recommended cleaner is Oakite 202 or similar, following manufacturer's instructions.

The two drain pan hoses are routed behind the condenser fan motor and compressor. The drain pan line(s) must be open to ensure adequate drainage.

7.13.1 Evaporator Coil Replacement

1. Pump unit down. (Refer to **Section 7.4**).

⚠ WARNING

Always turn OFF the unit circuit breakers (CB-1 & CB-2) and disconnect main power supply before working on moving parts.

2. With power OFF and power plug removed, remove the screws securing the panel covering the evaporator section (upper panel).
3. Disconnect the defrost heater wiring.
4. Remove the mounting hardware from the coil.
5. Unsolder the two coil connections, one at the distributor and the other at the coil header.
6. Disconnect the defrost temperature sensor (refer to **Section 7.26**) from the coil.
7. Remove middle coil support.
8. After defective coil is removed from unit, remove defrost heaters and install on replacement coil.
9. Install coil assembly by reversing above steps.
10. Leak check connections. Evacuate and add refrigerant charge.

7.13.2 Evaporator Heater Replacement

The heaters are wired directly back to the contactor and if a heater failure occurs during a trip, the heater set containing that heater may be disconnected at the contactor.

The next Pre-trip (P1) will detect that a heater set has been disconnected and indicate that the failed heater should be replaced. To remove a heater, do the following:

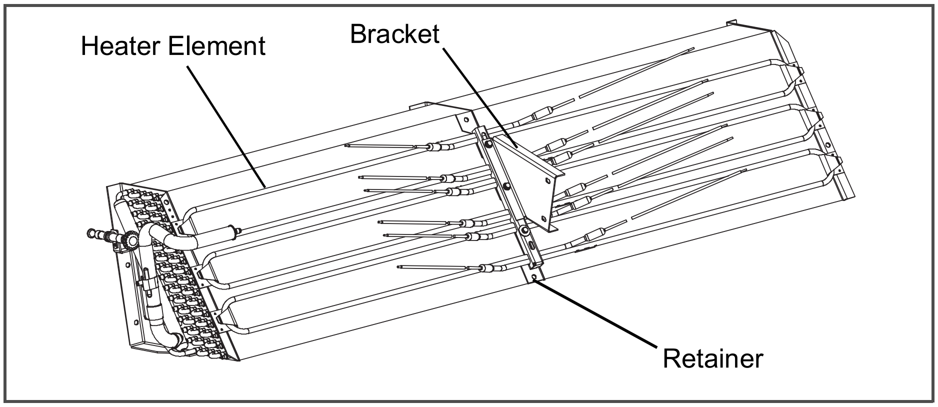
⚠ WARNING

Always turn OFF the unit circuit breakers (CB-1 & CB-2) and disconnect main power supply before working on moving parts.

1. Before servicing unit, make sure the circuit breakers (CB-1 and CB-2) and start-stop switch (ST) are in the OFF position, and the power plug is disconnected.
2. Remove the upper back panel.
3. Determine which heater(s) need replacing by checking resistance of each heater set. Refer to **Section 3.3** for heater resistance values. Once the set containing the failed heater is determined, cut the splice connection and retest to determine the actual failed heater(s).
4. Remove hold-down clamp securing heater(s) to coil.
5. Lift the bent end of the heater (with the opposite end down and away from coil). Move heater to the side enough to clear the heater end support and remove.

To replace a heater, perform steps 1 through 5 in reverse.

Figure 7.13 Heater Arrangement



7.14 Evaporator Fan and Motor Assembly

The evaporator fans circulate air throughout the container by pulling air in the top of the unit. The air is forced through the evaporator coil where it is either heated or cooled and then discharged out the bottom of the refrigeration unit into the container. The fan motor bearings are factory lubricated and do not require additional grease.

7.14.1 Replacing the Evaporator Fan Assembly

⚠ **WARNING**

Always turn OFF the unit circuit breakers (CB-1 & CB-2) and disconnect main power supply before working on moving parts.

1. Remove access panel by removing mounting bolts and TIR locking device. Reach inside of unit and remove the Ty-Rap securing the wire harness loop. Disconnect the connector by twisting to unlock and pulling to separate.
2. Loosen four 1/4-20 clamp bolts that are located on the underside of the fan deck at the sides of the fan assembly. Slide the loosened clamps back from the fan assembly.
3. Slide the fan assembly out from the unit and place on a sturdy work surface.

7.14.2 Disassemble the Evaporator Fan Assembly

1. Attach a spanner wrench to the two 1/4-20 holes located in the fan hub. Loosen the 5/8-18 shaft nut by holding the spanner wrench stationary and turning the 5/8-18 nut counter-clockwise (see **Figure 7.14**).
2. Remove the spanner wrench. Use a universal wheel puller and remove the fan from the shaft. Remove the washers and key.
3. Remove the four 1/4-20 x 3/4 long bolts that are located under the fan that support the motor and stator housing. Remove the motor and plastic spacer.

7.14.3 Assemble the Evaporator Fan Assembly

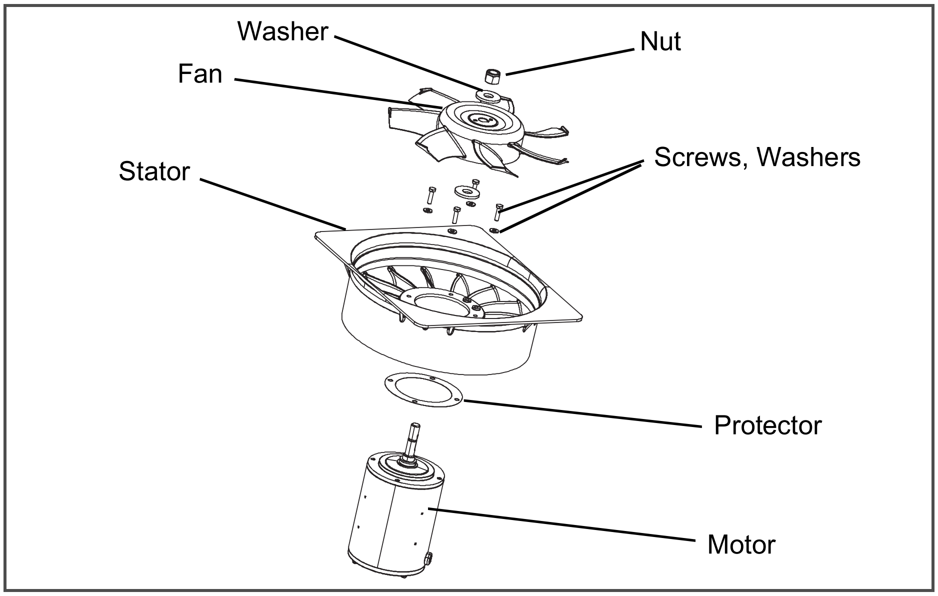
1. Assemble the motor and plastic spacer onto the stator.

NOTICE

When removing the black nylon evaporator fan blade, care must be taken to assure that the blade is not damaged. In the past, it was a common practice to insert a screwdriver between the fan blades to keep it from turning. This practice can no longer be used, as the blade is made up of a material that will be damaged. It is recommended that an impact wrench be used when removing the blade. Do not use the impact wrench when reinstalling, as galling of the stainless steel shaft can occur.

2. Apply Loctite to the 1/4-20 x 3/4 long bolts and torque to 0.81 mkg (70 inch-pounds).
3. Place one 5/8 flat washer on the shoulder of the fan motor shaft. Insert the key in the keyway and lubricate the fan motor shaft and threads with a graphite-oil solution (such as Never-seez).
4. Install the fan onto the motor shaft. Place one 5/8 flat washer with a 5/8-18 locknut onto the motor shaft and torque to 40 foot-pounds.

Figure 7.14 Evaporator Fan Assembly



5. Install the evaporator fan assembly in reverse order of removal. Torque the four 1/4-20 clamp bolts to 0.81 mkg (70 inch-pounds). Connect the wiring connector.
6. Replace access the panel making sure that the panel does not leak. Make sure that the TIR locking device is lockwired.

7.15 Evaporator Section Cleaning

Containers and Container units that are exposed to certain fumigants may develop visible surface corrosion. This corrosion will show up as a white powder found on the inside of the container and on the reefer unit evaporator stator and fan deck.

Analyses by Carrier Transicold environmental specialists have identified the white powder as consisting predominantly of aluminum oxide. Aluminum oxide is a coarse crystalline deposit most likely the result of surface corrosion on the aluminum parts within the container. If left untreated over time, it may build up in thickness and eventually flake as a lightweight white powder.

The surface corrosion of aluminum is brought about by exposure to chemicals such as sulfur dioxide and possibly other fumigants that are commonly used for fumigation and protection of some perishable cargo such as grapes, for example. Fumigation is the process by which a chemical is released into an enclosed area to eliminate infestations of insects, termites, rodents, weeds and soil-born disease.

Typically any aluminum oxide that becomes detached from evaporator fan stators will be blown into the wet evaporator coil where it will be caught and then flushed out of the unit during routine defrost cycles.

However, it is still highly recommended that after carrying cargo subject to fumigation procedures, that the inside of the unit be thoroughly cleansed prior to reuse.

Carrier Transicold has identified a fully biodegradable and environmentally safe alkaline cleaning agent (Tri-Pow'r® HD) for the unit. This will assist in helping to remove the corrosive fumigation chemicals and dislodging of the corrosive elements.

This cleaner is available from the Carrier Transicold Performance Parts Group (PPG) and can be ordered through any of the PPG locations; Part Number NU4371-88.

As a general safety precaution, before using this product, refer to and retain the Material Safety Data (MSDS) sheet.

Prior to Cleaning:

- Always wear goggles, gloves and work boots.
- Avoid contact with skin and clothing, and avoid breathing mists.
- When mixing, add water to the sprayer first, then the cleaner.
- ALWAYS provide for proper ventilation when cleaning indoor evaporator coils (rear doors must be open).
- Be aware of surroundings - food, plants, etc., and the potential for human exposure.
- Always read directions and follow recommended dilution ratios. More is not always better. Using non-diluted cleaner is not recommended.

Cleaning Procedure:

1. Remove the upper evaporator access panel inside of the unit.
2. Spray the surface with water before applying the cleaning solution. This helps the cleaner work better.
3. Liberally apply the prepared cleaner solution (5 parts water and 1 part cleaner).
4. Allow the cleaner to soak in for 5 to 7 minutes.
5. Assess area for rinsing. Follow all local regulations regarding disposal of waste water.
6. Thoroughly rinse the cleaner and surrounding area, floor, etc. When rinsing where heavy foaming solution is present, it is very important to take the time to thoroughly rinse the equipment and surroundings.
7. Always rinse the empty coil cleaner bottle, cap tightly and dispose of properly.

7.16 Electronic Expansion Valve (EEV)

The electronic expansion valve (EEV) is an automatic device which maintains required superheat of the refrigerant gas leaving the evaporator. The valve functions are: (a) automatic response of refrigerant flow to match the evaporator load and (b) prevention of liquid refrigerant entering the compressor. Unless the valve is defective, it seldom requires any maintenance.

7.16.1 Replacing Electronic Expansion Valve and Strainer

Removing an EEV:

⚠ WARNING

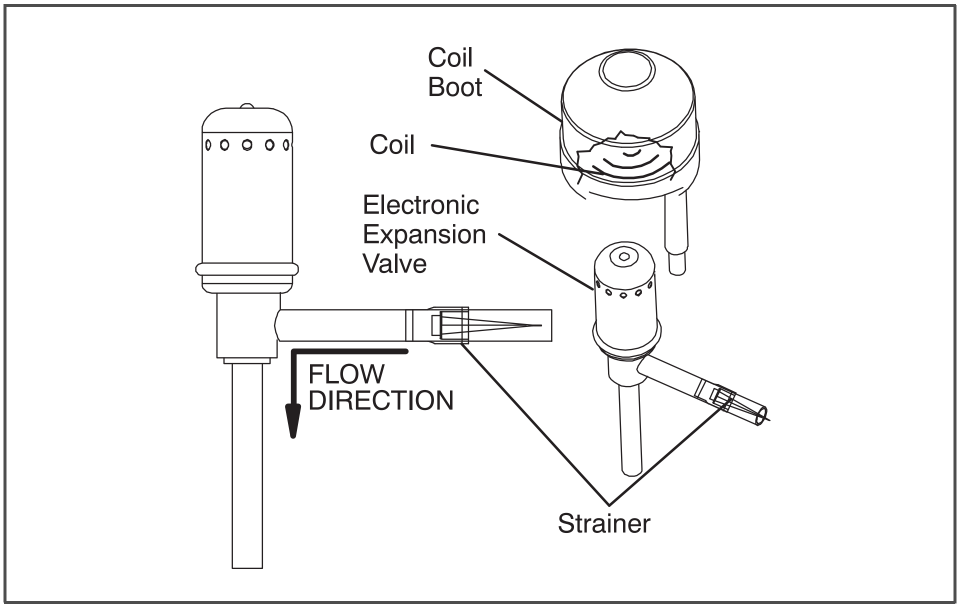
Always turn OFF the unit circuit breakers (CB-1 & CB-2) and disconnect main power supply before working on moving parts.

1. Pump down the compressor (refer to **Section 7.4**) and frontseat both suction and discharge valves.
2. Turn unit power off and remove power from the unit.
3. Remove coil.
4. VALVE REMOVAL: The preferred method of removing the valve is to cut the connection between the brazed section and the valve, using a small tube cutter. Remove valve.
5. Alternately, use a wet rag to keep valve cool. Heat inlet and outlet connections to valve body and remove valve.
6. Clean the valve stem with mild cleaner, if necessary.

Installing an EEV; Reverse steps 1 through 4 above to install a new valve.

1. Install the valve and a new strainer with the cone of strainer / screen pointing into liquid line at the inlet to the valve.
2. During installation, make sure the EEV coil is snapped down fully, and the coil retention tab is properly seated in one of the valve body dimples. Also, ensure that coil boot is properly fitted over valve body. See **Figure 7.15**.

Figure 7.15 Electronic Expansion Valve



3. Replace filter drier.
4. Evacuate to 500 microns by placing vacuum pump on liquid line and suction service valve.
5. Open liquid line service valve and check refrigerant level.
6. Check superheat. (Refer to **Section 3.2**).
7. Check unit operation by running Pre-trip (Refer to **Section 5.10**).

7.17 Humidity Sensor (HS)

The humidity sensor is an optional component that allows setting of a humidity set point in the controller. In dehumidification mode, the controller will operate to reduce internal container moisture level.

7.17.1 Checking the Operation of the Humidity Sensor (HS)

This procedure is to be performed in an effort to ease the troubleshooting of the humidity sensor. When performing this procedure and while working on the unit, always follow the proper lockout/tagout procedures.

Items Required:

- One 7/16” socket wrench or nut driver.
- One 1/4” socket wrench or nut driver.
- One clean, clear water bottle with a minimum 6 cm (2.5 in) opening and capacity to hold 500 ml (16.9 oz).
- 100 ml (3.4 oz) of fresh water - distilled if available.
- 50 gm of Salt (NaCl).

Procedure:

1. Remove the left Upper Fresh Air Makeup Vent panel.
2. Remove the humidity sensor from the mounting hardware and bring to the front of the access panel.

3. Disconnect the humidity sensor from the harness.
4. Drill a 3 cm (1.25 in) hole in the cap of a bottle.
5. Pour approximately 100 ml (3.4 oz) of water into the empty clean bottle.
6. Add salt to the water until it is present at the bottom of the bottle.
7. Cap the bottle and tape over the drilled hole.
8. Shake the bottle until the salt dissolves and water is saturated.

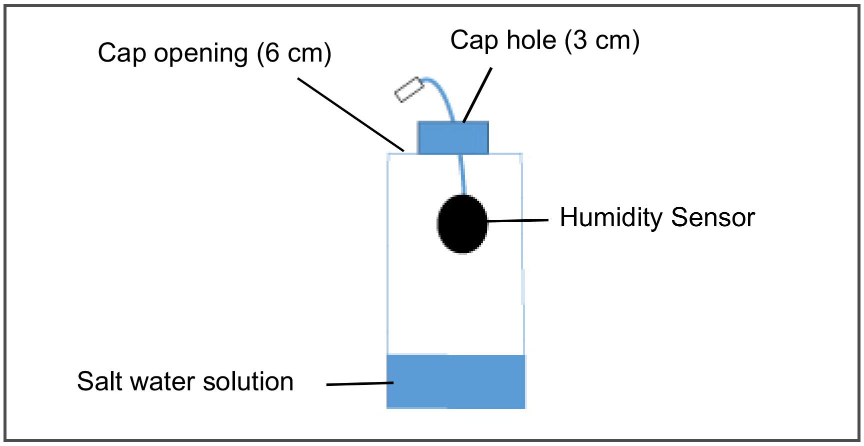
NOTE

To ensure saturation, add additional salt until it settles at the bottom without dissolving while shaking.

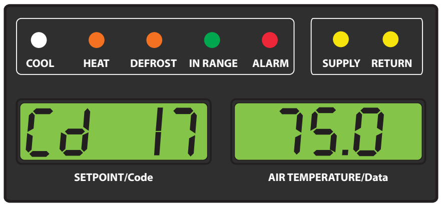
9. Remove the cap and insert the humidity sensor into the bottle through the bottle opening and pull the connector back through the drilled hole in the cap. Then, secure the cap and seal the wire going through the cap.

NOTE

Make sure that the sensor is not at all in contact with the salt water.

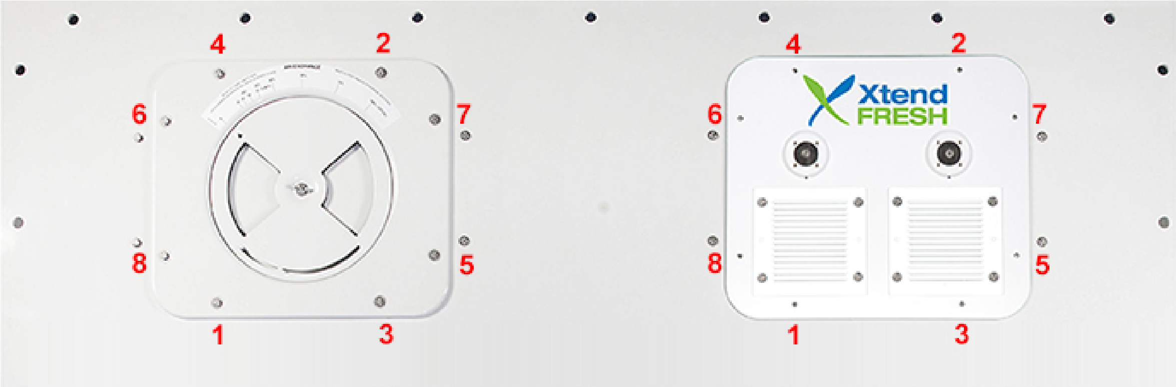


10. Allow the saturated salt mixture to settle for approximately ten minutes.
11. Reconnect the humidity sensor to the harness and power the reefer unit on.
12. Press the CODE SELECT key on the keypad.
13. Use the Arrow keys until “Cd17” is displayed then press the ENTER key.



14. This displays the humidity sensor reading. Verify the reading is between 60% and 85% relative humidity.
15. If the humidity sensor display is outside of this range, reconfirm the salt mixture and retest. If not in range, replace the sensor at the next opportunity.

16. Wipe clean and reinstall the humidity sensor and access panel. Torque the access panel hardware to 69 kg-cm (60 in.-lbs.) using a crossing pattern similar to the numbering below.



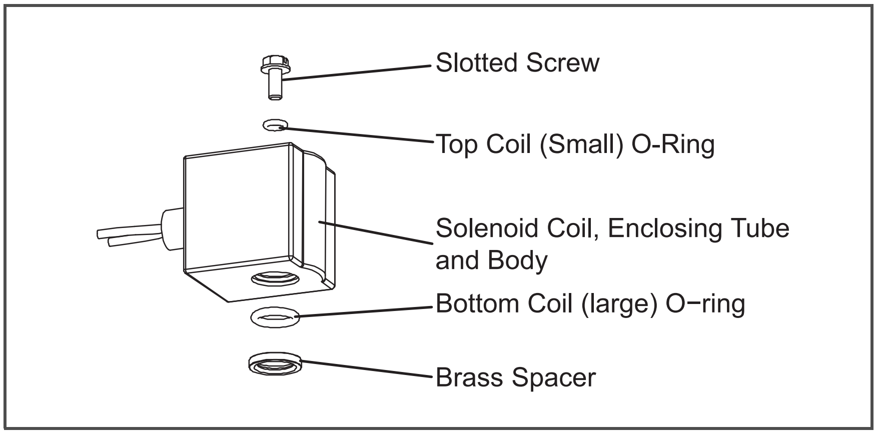
17. If the panel gasket is damaged and needs to be replaced, use the following part numbers:

- 42-00296-01: Standard Panel Gasket

42-00823-00: XtendFRESH Panel Gasket

7.18 Economizer Solenoid Valve (ESV)

Figure 7.16 Coil View of Economizer Solenoid Valve (ESV)


Slotted Screw
Top Coil (Small) O-Ring
Solenoid Coil, Enclosing Tube and Body
Bottom Coil (large) O−ring
Brass Spacer

Removing a Solenoid Valve Coil:

⚠ WARNING

Always turn OFF the unit circuit breakers (CB-1 & CB-2) and disconnect main power supply before working on moving parts.

1. Turn unit power off and remove power from the unit. Disconnect leads.
2. Remove top screw and o-ring. Remove coil and save mounting hardware, seals and spacer for reuse. (See **Figure 7.16**). Refer to step d. for valve coil replacement.

Removing the Solenoid Valve:

1. Pump down the compressor (refer to **Section 7.4**) and frontseat both suction and discharge valves.
2. VALVE REMOVAL: The preferred method of removing the solenoid valve is to cut the connection between the brazed section and the valve, using a small tube cutter. Remove valve. Alternately, heat inlet and outlet connections to valve body and remove valve.
3. Clean the valve stem with mild cleaner, if necessary.

Installing the Solenoid Valve:

1. Fit the new solenoid valve into position and braze. Use a wet rag to keep valve cool whenever brazing.

Installing the Solenoid Valve Coil:

1. Install the brass spacer on the valve stem.
2. Lubricate both o-rings with silicone provided in the kit.
3. Install bottom coil o-ring on the valve stem.
4. Install the solenoid coil on the valve stem.
5. Place the top coil o-ring on the coil mounting screw and secure the coil to the valve using a torque wrench. Torque the screw to 25 in-lbs.
6. Connect coil wires using butt-splices and heat-shrink tubing.

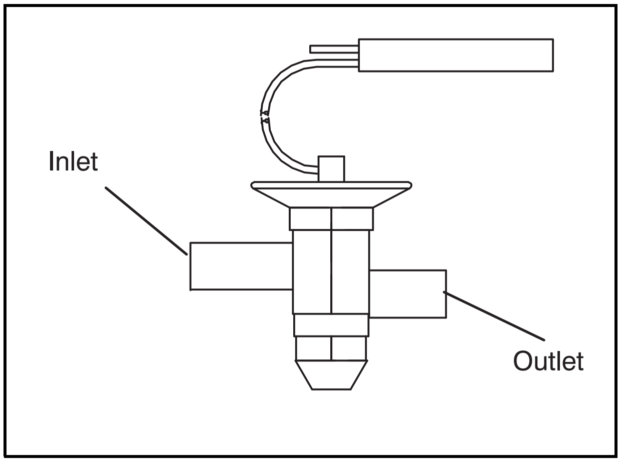
7.19 Economizer Expansion Valve (EXV)

The economizer expansion valve is an automatic device that maintains constant superheat of the refrigerant gas leaving at the point of bulb attachment, regardless of suction pressure.

Unless the valve is defective, it seldom requires maintenance other than periodic inspection to ensure that the thermal bulb is tightly secured to the suction line and wrapped with insulating compound.

7.19.1 Economizer Expansion Replacement

Figure 7.17 Economizer Expansion Valve



1. Removing the Economizer Expansion Valve:

NOTICE

The economizer expansion valve is a hermetic valve, it does not have adjustable superheat (See Figure 7.17).

   a. Pump down the compressor (refer to **Section 7.4**) and frontseat both suction and discharge valves. Evacuate if unit is not equipped with service valves. Refer to **Section 7.6**.
   b. Turn unit power off and remove power from the unit.
   c. Remove cushion clamps located on the inlet and outlet lines.
   d. Remove insulation (Presstite) from expansion valve bulb.
   e. Unstrap the bulb, located on the economizer line.
   f. VALVE REMOVAL: The preferred method of removing the valve is to cut the connection between the brazed section and the valve, using a small tube cutter. Remove valve. Alternately, use a wet rag to keep valve cool. Heat inlet and outlet connections to valve body and remove valve.

   g. Clean the valve stem with mild cleaner, if necessary.

2. Installing the Economizer Expansion Valve:
   a. The economizer expansion valve should be wrapped in a soaked cloth for brazing.
   b. Braze inlet connection to inlet line.
   c. Braze outlet connection to outlet line.
   d. Reinstall the cushion clamps on inlet and outlet lines.
3. Replace filter drier, (Refer to **Section 7.12**).
4. Evacuate to 500 microns by placing vacuum pump on liquid line and suction service valve.
5. Check economizer expansion valve superheat (see **Section 3.2**).

7.20 Troubleshooting P6-7 (DLV/DUV)

7.20.1 Digital Unloader Valve (DUV)

A failed digital unloader valve (DUV), which is normally closed,) or an internal seal failure of the compressor can result in the unit running continually in the fully loaded mode causing it to undershoot its set point temperature.

Both of these can be checked out by running pre-trip test P6-7. When running P6-7, the controller is looking for the differences in pressure and current draw between loaded mode and unloaded mode to make a judgment. If there are no differences, then it will show fail.

To confirm which what has caused the test to fail, perform the following additional test.

1. Connect manifold gauge set to discharge and suction service valves.
2. Front seat the SSV and pump down the compressor.
3. Front seat the discharge Service Valve.
4. Disconnect DUV from the top of compressor and cap the compressor fitting with the fitting removed from the service valve.
5. Using R134, pressurize the line to 50 psi (3.45 bar) at the suction service valve connection and check for leaks at the DUV outlet fitting at the compressor.
6. Energize DUV by placing a magnet on the valve stem opening the valve. Pressure will drop.

If a magnet is not available, a jumper procedure can be used as follows:

1. Remove all 4 controller fuses (F1, F2, F3a, F3b).
2. Remove the KA6 wire from KA controller connector on the front of the controller.
3. Disconnect the X1 wire from the 24VAC side of transformer (black wire) and locate it away from the transformer.
4. Jumper between the black transformer wires to the KA6 wire removed from the connector.
5. Connect power to unit and turn circuit breaker on (DUV coil is now energized).
6. Pressure should drop.
7. Power circuit breaker off, reconnect wires and reinstall fuses.

If the valve opens and closes properly, the failure mode is with the compressor and it should be changed at the earliest opportunity.

7.20.2 Digital Loader Valve and Unloader Valve (DLV/DUV)

The EDGE model also has a digital loader valve (DLV normally closed). A failed digital loader valve will result in the unit's inability to cool due to a reduction in refrigerant flow where a failed digital unloader valve / DUV (normally closed) will result in the unit undershooting its set point due to its inability to unload the compressor.

Both of these valves can be checked out by running pre-trip test P6-7. If pre-trip test P6-7 fails then the following checks need to be made to identify which of the valves has failed.

1. Connect manifold gauge set to Discharge and Suction service valves. Refer to **Section 7.2**.

2. Using Code 41, Service function, Valve Override Control as follows:
    a. Set the tIM (Override Time to ~5 minutes)
    b. Set the PCnt: Detailed below
    c. Display Code 03, Compressor Motor Current value

By monitoring the compressor amperage and pressure, the technician can determine which component has failed.

Set the PCnt (100%setting – DLV Capacity TEST)

If the compressor is able to load, the compressor amperage and the discharge pressure will rise and the suction pressure will drop – DLV is okay. If discharge pressure does not rise, the DLV should be replaced.

The Digital Loader Valve Solenoid coil cycles: 0 to 0.6 amp DC (AC/DC current clamp)

Set the PCnt (20%setting – DUV Modulation TEST).

If the compressor is able to unload, the compressor amperage and discharge pressure drops and the suction pressure will climb – DUV is okay. If the discharge pressure does not decrease after the valve energizes, replace the DUV.

Unloader Valve Solenoid coil cycles: 0 to 0.4 amp AC (AC/DC current clamp)

7.21 Digital Loader Valve

7.21.1 Digital Loader Valve Replacement

1. Removing the DLV:
    a. Pump down the compressor (refer to **Section 7.4**) and frontseat both suction and discharge valves. In the event the DLV is stuck open and compressor cannot pump down, remove charge.

⚠ CAUTION

The scroll compressor achieves low suction pressure very quickly. Do not use the compressor to evacuate the system below 0 psig. Never operate the compressor with the suction or discharge service valves closed (frontseated). Internal damage will result from operating the compressor in a deep vacuum.

    b. Turn unit power off and remove power from the unit.
    c. Loosen bolt on top of the DLV and remove coil assembly.

NOTICE

There is a small spacer tube between the top of the valve and the 12 VDC coil that needs to be reinstalled into the solenoid valve coil. When removing the coil, it may fall out when lifted from the valve body. Take care that the spacer is not lost; the valve will not function correctly without it.

    d. Remove clamps holding the DLV to the discharge line.
    e. Loosen the nuts attaching the DLV to the top of the compressor.
    f. VALVE REMOVAL: The preferred method of removing the solenoid valve is to cut the connection between the brazed section and the valve, using a small tube cutter. Remove valve.

Alternately, use a wet rag to keep valve cool. Heat outlet connection to valve body and remove valve.

    g. Examine compressor and service valves. Ensure that the o-ring is not stuck in the gland of the valve.
    h. Discard the o-ring on the o-ring face seal connection.

2. Installing the DLV:
    a. Lubricate the gland shoulder area and o-ring with refrigerant oil.
    b. Fit new valve in position and hand-tighten the o-ring nut.
    c. Use a wet rag to keep valve cool while brazing. Braze DLV to service valve connection.
    d. Reinstall and tighten the brackets that secure the valve body to the discharge line.

e. Torque o-ring face seal connections to 18 to 20 ft-lbs.

f. Install the coil onto the valve body and tighten the attachment bolt.

NOTICE

Confirm that the small spacer tube is inserted into the coil prior to attaching it to the valve body. The valve will not function correctly without it.

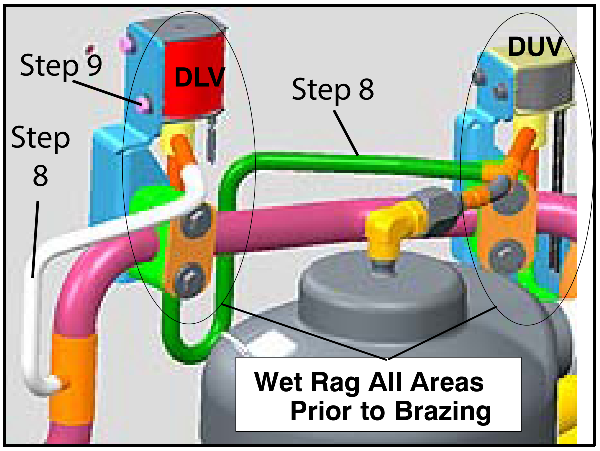
g. Leak check and evacuate low side of unit as applicable. Refer to **Section 7.6**.

h. Open service valves.

7.21.2 Digital Loader Installation

1. Power unit off and lock/tag out to prevent inadvertent power up.
2. Remove 8 bolts from guard under control box and remove guard.
3. Remove the digital unloader valve coil (DUV) and place a magnet tool on the valve to open it. If a magnet is not available perform the Jumper procedure:
    a. Remove all 4 controller fuses (F1, F2, F3a, F3b).
    b. Remove the wire from the KA6 connector on the front of the controller.
    c. Disconnect the X1 wire from the 24VAC side of transformer (black wire) and locate it away for the transformer.
    d. Jumper the black transformer wire to the KA6 wire removed from the connector.
    e. Connect power to unit and turn circuit breaker on (DUV coil is now energized).
4. Connect a refrigerant recovery machine and recover refrigerant from the unit. (refer to the recovery machines Operation and Service manual for proper procedures).
5. If jumper procedure was used for the recovery, turn the circuit breaker off and disconnect the power. Follow the regional lock out tag out procedure for electrical.
6. Isolate valve by removing wire type wraps and conduit. Save any removed conduit for re-installation.
7. Remove top screw from the valve coil removing the coil and spacer. Ensure to retain the spacer as it is required for proper operation of the valve. Position coil away from valve body.
8. Using a tubing cutter cut the DLV refrigerant line as marked in **Figure 7.18**.

Figure 7.18 DLV Installation



9. Unbolt the valve from the mounting bracket and remove the valve assembly from the unit.
10. Clean pipework stubs on both unit and valve assembly in preparation for brazing.
11. Refit valve coil to the valve body ensuring the spacer ring is in place.
12. Slide new valve assembly into place, coupling the refrigerant lines.

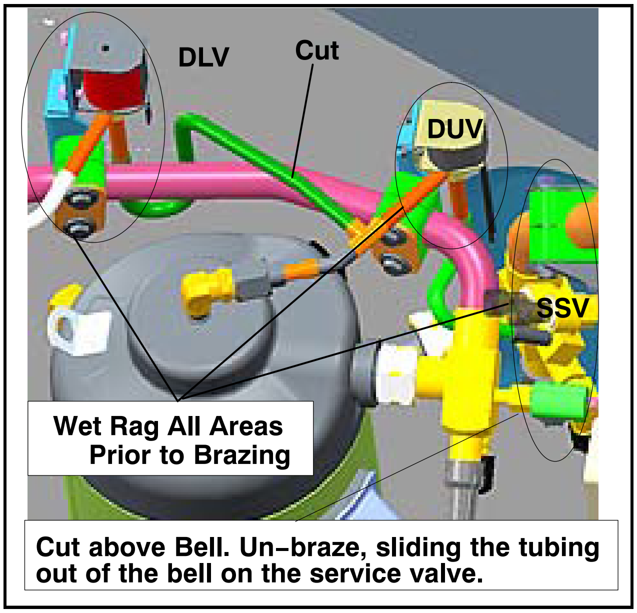
13. Attach the solenoid coil to the mounting bracket of the new valve body and tighten.
14. Wet rag valve body and bracket mounting clamp. Failure to wet rag the body may result in the failure of the valve.
15. Using silver solder braze both bell connections.
16. Replace the filter drier.
17. With magnet still on the DUV stem, evacuate the compressor to 1000 Microns. If jumper procedure was used in step 3, reconnect unit to power and turn on the circuit breaker to again power the DUV.
18. On completion of the vacuum, remove the magnet and reinstall the DUV coil. If a jumper was used, turn off the circuit breaker and disconnect power. Remove jumper and reconnect the X1 wire to the black transformer wire. Reinstall and secure the KA6 wire to the KA plug at the controller.
19. Weigh the proper refrigerant charge into the unit as per the units operation and service manual and perform a leak check of the system.
20. Replace the guard under the control box.
21. If changed under the units warranty, tag part with unit information and cause of failure.
22. If possible collect unit data download for future failure analysis.

7.22 Digital Unloader Valve

7.22.1 Digital Unloader Replacement

1. Power unit off and lock out / tag out to prevent inadvertent power up. Follow the regional lock out tag out procedure for electrical system.
2. Remove 8 bolts from guard under control box and remove guard.
3. Remove the digital unloader valve coil (DUV) and place a magnet tool on the valve to open it. If a magnet is not available perform the Jumper procedure:
    a. Remove all 4 controller fuses (F1, F2, F3a, F3b).
    b. Remove the wire from the KA6 connector on the front of the controller.
    c. Disconnect the X1 wire from the 24VAC side of transformer (black wire) and locate it away for the transformer.
    d. Jumper the black transformer wire to the KA6 wire removed from the connector.
    e. Connect power to unit and turn circuit breaker on (DUV coil is now energized).
4. Using a refrigerant recovery machine, remove the refrigerant from the unit. Refer to the Operation and Service manual of the selected recovery machine for proper procedures.
5. On completion of the recovery, if the jumper procedure was used turn the circuit breaker off and disconnect the power. Follow the regional lock out tag out procedure for electrical system.
6. Remove insulation from suction line to prevent damage while brazing.
7. If coil was not removed in step three, remove the top screw from DUV coil and remove coil. Position coil away from valve body.
8. Cut the cable tie for the compressor dome temperature sensor and move wiring to one side.
9. Using a tubing cutter, cut the lines marked at locations in **Figure 7.19**.

Figure 7.19 DUV Installation


DLV
Cut
DUV
SSV
Wet Rag All Areas Prior to Brazing
Cut above Bell. Un–braze, sliding the tubing out of the bell on the service valve.

10. Remove the unloader connection to the compressor. Discard the O-ring as it will be replaced. Ensure that the O-ring is not left attached to the compressor connection.
11. Remove the DUV coil to bracket mounting screws.
12. Slide the bracket assembly out (right and forwards between suction and discharge lines).
13. Wet wrap the suction service valve and Un-braze the remaining section of line to the bell connection at the suction service valve.
14. Clean pipework stubs on both unit and valve assembly in preparation for brazing.
15. Install coil onto the replacement valve stem and slide into place.
16. Loosely couple the refrigerant connections and secure the coil to the mounting bracket.
17. Lubricate the gland shoulder area and O-ring (42-00243-04) with refrigerant oil and fit the economizer connection to the compressor.
18. Re-secure the coil to the bracket.
19. Torque unloader connection to the compressor 24.5 to 27 Nm (18 to 20 ft-lbs).
20. Insert heat shield behind the two braze points.
21. Wet rag both the DUV, DLV and the suction service valve bodies and clamp. Failure to wet rag the body and mounts body may result in future failure. Using silver solder braze both connections.
22. Replace the filter drier.
23. If magnet was used in step 3; remove the DUV coil and place magnet on the stem to open the valve for evacuation. If jumper procedure was used in step 3, reconnect unit to power and turn on the circuit breaker to again power the DUV.
24. Evacuate the unit to 1000 Microns.
25. On completion of the vacuum, remove the magnet and reinstall the DUV coil. If a jumper was used, turn off the circuit breaker and disconnect power. Remove jumper and reconnect the X1 wire to the black transformer wire. Reinstall and secure the KA6 wire to the KA plug at the controller.
26. Weigh the proper refrigerant charge into the unit as per the units operation and service manual and perform a leak check of the system.
27. Reposition and secure the wires and suction line insulation.
28. Replace the guard under the control box.
29. If changed under the units warranty, tag part with unit information and cause of failure.
30. If possible collect unit data download for future failure analysis.

7.23 Valve Override Controls

Controller function code Cd41 is a configurable code that allows timed operation of the automatic valves for troubleshooting. Test sequences are provided in **Table 7–1**. Capacity mode (CAP) allows alignment of the economizer solenoid valve in the standard and economized operating configurations. DLV and DUV Capacity Modulation,% Setting (PCnt) and Electronic Expansion Valve (EEV) allows opening of the digital unloader valve and electronic expansion valve, respectively, to various percentages. If the unit is equipped with an LIV, the Liquid Valve Setting allows the LIV to be automatically controlled, or manually opened and closed.

The Override Timer (tIM) selection is also provided to enter a time period of up to five minutes, during which the override(s) are active. If the timer is active, valve override selections will take place immediately. If the timer is not active, changes will not take place for a few seconds after the timer is started. When the timer times out, the override function is automatically terminated and the valves return to normal machinery control. To operate the override:

1. Press the CODE SELECT key then press an ARROW key until Cd41 is displayed in the left window. The right window will display a controller communications code.
2. Press the ENTER key. The left display will show a test name alternating with the test setting or time remaining. Use an ARROW key to scroll to the desired test. Press the ENTER key, SELCt will appear in the left display.
3. Use an ARROW key to scroll to the desired setting, and then press the ENTER key. Selections available for each of the tests are provided in Table 7-1.
4. If the timer is not operating, follow the above procedure to display the timer. Use an ARROW key to scroll to the desired time interval and press ENTER to start the timer.
5. The above described sequence may be repeated during the timer cycle to change to another override.
6. The above described sequence may be repeated during the timer cycle to change to another override.

Table 7–1 Valve Override Control Displays

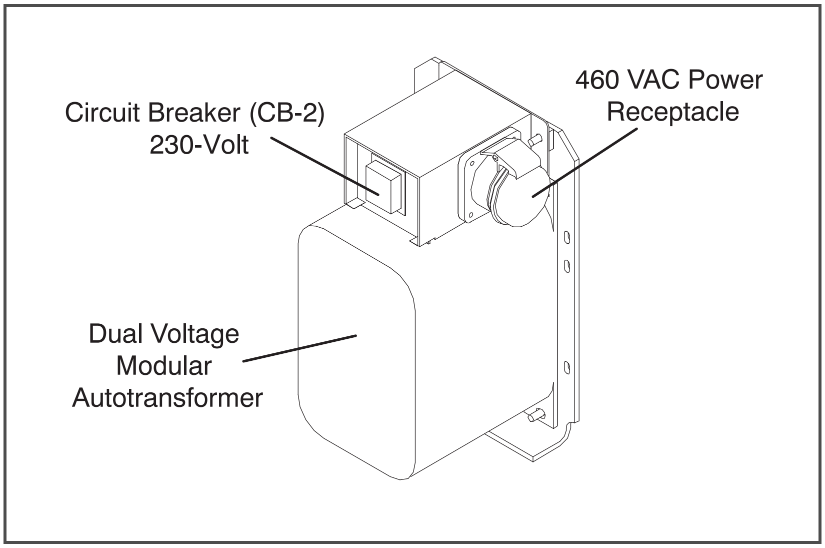
Left Display	Controller Communications Codes (Right Display)	Setting Codes (Right Display)
Cd 41/SELCt	**tIM** (Override Timer)	**0 00** (0 minutes/0 Seconds) In 30 second increments to **5 00** (5 minutes/ 0 seconds)
	PCnt (% Setting - DLV/DUV Capacity)	**AUtO** (Normal Machinery Control) 036 10 25 50 100
	EEV (% Setting - Electronic Expansion Valve)	**AUtO** (Normal Machinery Control) **CLOSE** (Closed) 036 10 25 50 100
	CAP (Capacity Mode)	**AUtO** (Normal Control)
		Std **UnLd** (Economizer = Closed)
		ECOn (Economizer = Open)

7.24 Autotransformer

If the unit does not start, check the following:

1. Make sure the 460 VAC (yellow) power cable is plugged into the receptacle (see **Figure 7.20**) and locked in place.
2. Make sure that circuit breakers CB-1 and CB-2 are in the "ON" position. If the circuit breakers do not hold in, check voltage supply.
3. There is no internal protector for this transformer design, therefore, no checking of the internal protector is required.
4. Using a voltmeter, and with the primary supply circuit ON, check the primary (input) voltage (460 VAC). Next, check the secondary (output) voltage (230 VAC). The transformer is defective if output voltage is not available.

Figure 7.20 Autotransformer



7.25 Controller

7.25.1 Handling Modules

⚠ CAUTION

Do not remove wire harnesses from circuit boards unless you are grounded to the unit frame with a static safe wrist strap or equivalent static drain device.

⚠ CAUTION

Remove the controller module and unplug all connectors before performing any arc welding on any part of the container.

The guidelines and cautions provided herein should be followed when handling the modules. These precautions and procedures should be implemented when replacing a module, when doing any arc welding on the unit, or when service to the refrigeration unit requires handling and removal of a module.

1. Obtain a grounding wrist strap (Carrier Transicold P/N 07-00304-00) and a static dissipation mat (Carrier Transicold P/N 07-00277-00). The wrist strap, when properly grounded, will dissipate any potential static buildup on the body. The dissipation mat will provide a static-free work surface on which to place and/or service the modules.
2. Disconnect and secure power to the unit.

3. Place strap on wrist and attach the ground end to any exposed unpainted metal area on the refrigeration unit frame (bolts, screws, etc.).
4. Carefully remove the module. Do not touch any of the electrical connections if possible. Place the module on the static mat.
5. The strap should be worn during any service work on a module, even when it is placed on the mat.

7.25.2 Controller Troubleshooting

A group of test points (TP, see **Figure 7.21**) are provided on the controller for troubleshooting electrical circuits (see schematic diagram, **Section 8**). A description of the test points follows:

NOTICE

Use a digital voltmeter to measure AC voltage between TP's and ground (TP9), except for TP8.

TP 1 - Not used in this application.

TP 2 - Enables the user to check if the high pressure switch (HPS) is open or closed.

TP 3 - Enables the user to check if the water pressure switch (WP) contact is open or closed.

TP 4 - Enables the user to check for power availability to the DUV contact TD.

TP 5 - Enables the user to check if the internal protectors for the evaporator fan motors (IP-EM1 or IP-EM2) are open or closed.

TP 6 (IF EQUIPPED) - Enables the user to check if the controller liquid injection valve relay (TQ) is open or closed.

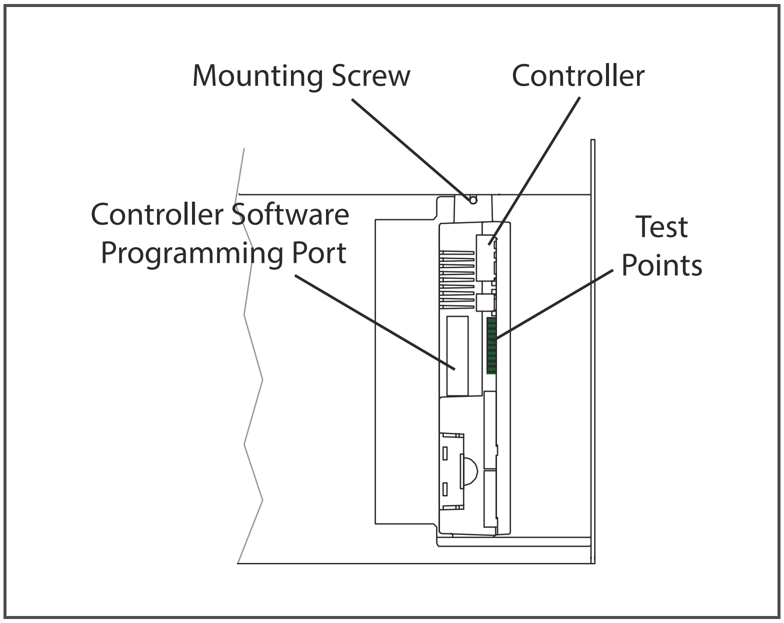
TP 7 - Enables the user to check if the controller economizer solenoid valve relay (TS) is open or closed.

TP 8 - Not used in this application.

TP 9 - The chassis (unit frame) ground connection.

TP 10 - Enables the user to check if the heat termination thermostat (HTT) contact is open or closed.

Figure 7.21 Controller Section of the Control Box



7.25.3 Controller Programming Procedure

⚠ CAUTION

The unit must be OFF whenever a programming card is inserted or removed from the controller programming port.

1. Turn unit OFF, via start-stop switch (ST).

2. Insert software/programming PCMCIA card containing the following (example) files into the programming/ software port. (See **Figure 7.21**):

   menuDDMM.ml3, this file allows the user to select a file/program to upload into the controller.

cfYYMMDD.ml3, multi-configuration file.

3. Turn unit ON, via start-stop switch (ST).

7.25.4 Programming Procedure for Software Versions 5354 & Greater With Updated Menu Option (menu0115.ml)

NOTICE

Units must be loaded with software version 5354 or higher. See the label in the control box door for factory installed software version. The updated menu option allows the operational software to be loaded, and time and container identification to beset.

Procedure for Loading Operational Software:

1. The display module will display the message Set UP.
2. Press the UP or DOWN arrow key until the display reads, LOAd 53XX for Scroll.
3. Press the ENTER key on the keypad.
4. The display will alternate to between PrESS EntR and rEV XXXX.
5. Press the ENTER key on the keypad.
6. The display will show the message “Pro SoFt”. This message will last for up to one minute.
7. The display module will go blank briefly, then read “Pro donE” when the software loading has loaded. (If a problem occurs while loading the software: the display will blink the message “Pro FAIL” or “bad 12V.” Turn start-stop switch OFF and remove the card.)
8. Turn unit OFF, via start-stop switch (ST).
9. Remove the PCMCIA card from the programming/software port and return the unit to normal operation by placing the start-stop switch in the ON position.
10. Turn power on and wait about 15 seconds for the new software to load into the controller memory. The status LED will flash quickly and the display will remain blank as the controller loads the new software.

    When complete, the controller will reset and power up normally.
11. Wait for default display, setpoint on the left, and control temperature on the right.
12. Confirm software is correct using keypad code select 18 to view Cd18 XXXX.
13. Turn power off. Operational software is loaded.

Procedure for Loading Configuration Software:

1. Turn unit OFF using start-stop switch (ST).
2. Insert software/programming PCMCIA card containing the following (example) files into the programming/ software port. (See **Figure 7.21**): menuDDMM.ml3, this file allows the user to select the file/program to upload into the controller. cfYYMMDD.ml3, multi-configuration file.
3. Turn unit ON using start-stop switch (ST).
4. Press the UP or DOWN arrow key until display reads Set UP.
5. Press the ENTER key on the keypad.
6. Press the UP or DOWN arrow key until display reads XXXX the message ruN COnFG. (If a defective card is being used the display will blink the message “bAd CArd.” Turn start-stop switch OFF and remove the card.)
7. Press the ENTER key on the keypad.

8. The display module will go blank briefly and then display “551 00”, based on the operational software installed.
9. Press the UP or DOWN ARROW key to scroll through the list to obtain the proper model dash number. (If a defective card is being used, the display will blink the message “bAd CArd.” Turn start-stop switch OFF and remove the card.)
10. Press the ENTER key on the keypad.
11. When software loading has successfully completed, the display will show the message “EEPrM donE.” (If a problem occurs while loading the software, the display will blink the message “Pro FAIL” or “bad 12V.” Turn start-stop switch OFF and remove the card.) 12.Turn unit OFF using start-stop switch (ST).
12. Remove the PCMCIA card from the programming/software port and return the unit to normal operation by placing the start-stop switch in the ON position.
13. Confirm correct model configuration using the keypad to choose code 20 (CD20). The model displayed should match the unit serial number plate.

Procedure for Setting the Date and Time:

1. Press the UP or DOWN arrow key until display reads Set TIM.
2. Press the ENTER key on the keypad.
3. The first value to be modified is the date in YYYY MM-DD format. The values will be entered from right to left. Press the UP or DOWN ARROW key to increase or decrease the values. The ENTER key will enter the information for the current field and move to the next value; the CODE SELECT key will allow modification of the previous value.
4. Press the ENTER key on the keypad.
5. The next value to be modified is the time in HH MM format. The values will be entered from right to left. Press the UP or DOWN ARROW key to increase or decrease the values. The ENTER key will enter the information for the current field and move to the next value; the CODE SELECT key will allow modification of the previous value.
6. Press the ENTER key on the keypad. The date and time will not be committed until start up procedures are completed on the next power up.

Procedure for Setting the Container ID:

NOTICE

The characters will be preset to the container ID already on the controller. If none exist, the default will be AAAA0000000.

1. Press the UP or DOWN arrow key until display reads Set ID.
2. Press the ENTER key on the keypad.
3. Values will be entered from right to left. Press the UP or DOWN ARROW key to increase or decrease the values. ENTER will enter the information for the current field and move to the next value; CODE SELECT will allow modification of the previous value.
4. When the last value is entered, press the ENTER key to enter the information to the controller; the CODE SELECT key will allow modification of the previous value.

7.25.5 Removing and Installing a Controller

Removal:

1. Disconnect all front wire harness connectors and move wiring out of way.
2. The lower controller mounting is slotted, loosen the top mounting screw (see **Figure 7.21**) and lift up and out.
3. Disconnect the back connectors and remove module.

4. When removing the replacement module from its packaging, note how it is packaged. When returning the old module for service, place it in the packaging in the same manner as the replacement. The packaging has been designed to protect the module from both physical and electrostatic discharge damage during storage and transit.

Installation:

Install the module by reversing the removal steps.

Torque values for mounting screws (see **Figure 7.21**) are 0.23 mkg (20 inch-pounds). Torque value for the connectors is 0.12 mkg (10 inch-pounds).

7.25.6 Battery Replacement

Standard Battery Location (Standard Cells):

1. Turn unit power OFF and disconnect power supply.
2. Slide bracket out and remove old batteries. (See **Figure 4.4**, Item 8.)
3. Install new batteries and slide bracket into control box slot.

⚠ CAUTION

Use care when cutting wire ties to avoid nicking or cutting wires.

Standard Battery Location (Rechargeable Cells):

1. Turn unit power OFF and disconnect power supply.
2. Disconnect battery wire connector from control box.
3. Slide out and remove old battery and bracket. (See **Figure 4.4**, Item 8.)
4. Slide new battery pack and bracket into the control box slot.
5. Reconnect battery wire connector to control box and replace wire ties that were removed.

Secure Battery Option (Rechargeable Cells Only):

1. Turn unit power OFF and disconnect power supply.
2. Open control box door and remove both the high voltage shield and clear plastic rain shield (if installed).
3. Disconnect the battery wires from the “KA” plug positions 14, 13, 11.
4. Using Driver Bit, Carrier Transicold part number 07-00418-00, remove the 4 screws securing the display module to the control box. Disconnect the ribbon cable and set the display module aside.

NOTICE

The battery wires must face toward the right.

5. Remove the old battery from the bracket and clean bracket surface. Remove the protective backing from the new battery and assemble to the bracket. Secure battery by inserting the wire tie from the back of the bracket around the battery, and back through the bracket.
6. Reconnect the ribbon cable to display and re-install the display.
7. Route the battery wires from the battery along the display harness and connect the red battery wire and one end of the red jumper to “KA14,” the other end of the red jumper wire to “KA11,” and the black wire to “KA13.”
8. Replace wire ties that were removed.

7.26 Temperature Sensor Service

Service procedures for the return recorder, return temperature, supply recorder, supply temperature, ambient, defrost temperature, evaporator temperature, and compressor discharge temperature sensors are provided in the following sub paragraphs.

7.26.1 Ice Bath Preparation

The ice-water bath is a method for testing the accuracy of sensors by submerging the sensors in an insulated container with ice cubes or chipped ice, then filling voids between ice with water and agitating until mixture reaches 0°C (32°F) measured on a laboratory thermometer.

Notes:

- Wherever possible, use a thermometer that is regularly calibrated by an accredited test lab. Contact your instrument representative if the reference thermometer is not showing correct readings.
- Always use a temperature measurement reference instrument which is of higher accuracy than the device checked – for e.g., a thermometer with a rated accuracy of +/- 0.2 °C should be used to check a device with a rated accuracy +/- 0.3 °C.
- A thermally insulated container, tub open to atmosphere and large enough to contain crushed ice and water should be used. The tub should be large enough to contain the unit’s sensor and the reference thermometer.
- Enough distilled water should be available to make ice cubes and to set up a proper and stable ice-water triple point mixture. Prepare ice using distilled water.
- Pre-cool distilled water for testing.

Procedure:

1. Prepare a mixture of clean ice using distilled water in a clean insulated container. If possible, the person handling should be wearing latex gloves.
    a. Crush or chip the ice to completely fill the container. The finer the ice particles, the more accurate the mixture.
    b. Add enough pre-cooled distilled water to fill the container.
    c. Stir the mixture for a minimum of 2 minutes to ensure water is completely cooled and good mixing has occurred.
    d. The mixture should generally contain about 85% ice with the distilled water occupying the rest of the space.
    e. Add more ice as the ice melts.
2. Stir the ice water slurry mixture to maintain a temperature 0°C (32°F).
3. Constantly monitor the temperature of the ice water slurry with your reference thermometer. Ensure that the temperature of the bath has stabilized. The criterion for stability generally is to take two readings at 1 minute intervals, and the two readings should give you 0°C (32°F).

7.26.2 Sensor Checkout Procedure

To verify the accuracy of a temperature sensor:

1. Remove the sensor and place in a 0°C (32°F) ice-water bath. Refer to the **Ice Bath Preparation** procedure.
2. Start unit and check sensor reading on the control panel. The reading should be 0°C (32°F). If the reading is correct, reinstall sensor; if it is not, continue with the next step.
3. Place the Start-Stop switch (ST) to “0” to turn the unit Off. Disconnect the power supply.
4. Refer to **Section 7.25** and remove controller to gain access to the sensor plugs.
5. Using the plug connector marked “EC” that is connected to the back of the controller, locate the sensor wires (RRS, RTS, SRS, STS, AMBS, DTS, or CPDS as required). Follow those wires to the connector and using the pins of the plug, measure the resistance. Values are provided in **Table 7–2** and **Table 7–3**.

Due to the variations and inaccuracies in ohmmeters, thermometers or other test equipment, a reading within 2% of the chart value would indicate a good sensor. If a sensor is defective, the resistance reading will usually be much higher or lower than the resistance values given.

Table 7–2 Sensor Resistance - AMBS, DTS, ETS, RRS, RTS, SRS, STS

°C	°F	OHMS		°C	°F	OHMS
-40	-40	336,500		6	42.8	24,173
-39	-38.2	314,773		7	44.6	23,017
-38	-36.4	294,600		8	46.4	21,922
-37	-34.6	275,836		9	48.2	20,886
-36	-32.8	258,336		10	50	19,900
-35	-31	242,850		11	51.8	18,975
-34	-29.2	228,382		12	53.6	18,093
-33	-27.4	214,164		13	55.4	17,258
-32	-25.6	200,909		14	57.2	16,466
-31	-23.8	188,545		15	59	15,715
-30	-22.0	177,000		16	60.8	15,002
-29	-20.2	166,360		17	62.6	14,325
-28	-18.4	156,426		18	64.4	13,683
-27	-16.6	147,148		19	66.2	13,073
-26	-14.8	138,478		20	68	12,494
-25	-13	130,374		21	69.8	11,944
-24	-11.2	122,794		22	71.6	11,420
-23	-9.4	115,702		23	73.4	10,923
-22	-7.6	109,063		24	75.2	10,450
-21	-5.8	102,846		**25**	**77**	**10,000**
-20	-4	97,022		26	78.8	9,572
-19	-2.2	91,563		27	80.6	9,164
-18	-0.4	86,445		28	82.4	8,777
-17	1.4	81,644		29	84.2	8,407
-16	3.2	77,139		30	86	8,055
-15	5	72,910		31	87.8	7,720
-14	6.8	68,938		32	89.6	7,401
-13	8.6	65,206		33	91.4	7,096
-12	10.4	61,699		34	93.2	6,806
-11	12.2	58,401		35	95	6,529
-10	14	55,330		36	96.8	6,265
-9	15.8	52,381		37	98.6	6,013
-8	17.6	49,634		38	100.4	5,772
-7	19.4	47,047		39	102.2	5,543
-6	21.2	44,610		40	104.0	5,323
-5	23	42,314		41	105.8	5,114
-4	24.8	40,149		42	107.6	4,914
-3	26.6	38,108		43	109.4	4,723
-2	28.4	36,182		44	111.2	4,540
-1	30.2	34,365		45	113	4,365
0	**32**	**32,650**		46	114.8	4,198
1	33.8	31,030		47	116.6	4,038
2	35.6	29,500		48	118.4	3,885
3	37.4	28,054		49	120.2	3,739
4	39.2	26,688		50	122	3,599
5	41	25,396				

Table 7–3 Sensor Resistance - PrimeLINE CPDS

°C	°F	OHMS		°C	°F	OHMS
-40	-40	2,889,600		18	64.4	117,656
-38	-36.4	2,532,872		20	68.0	107,439
-36	-32.8	2,225,078		22	71.6	98,194
-34	-29.2	1,957,446		24	75.2	89,916
-32	-25.6	1,724,386		**25**	**77**	**86,113**
-30	-22.0	1,522,200		26	78.8	82,310
-28	-18.4	1,345,074		28	82.4	75,473
-26	-14.8	1,190,945		30	83.0	69,281
-24	-11.2	1,056,140		32	89.6	63,648
-22	-7.6	938,045		34	93.2	58,531
-20	-4.0	834,716		36	96.8	53,887
-18	-0.4	743,581		38	100.4	49,656
-16	3.2	663,593		40	104.0	45,812
-14	6.8	593,030		42	107.6	42,294
-12	10.4	530,714		44	111.2	39,078
-10	14.0	475,743		46	114.8	36,145
-8	17.6	426,904		48	118.4	33,445
-6	21.2	383,706		50	122.0	30,985
-4	24.8	345,315		52	125.6	28,724
-2	28.4	311,165		54	129.2	26,651
0	**32.0**	**280,824**		56	132.8	27,750
2	35.6	253,682		58	136.4	23,005
4	39.2	229,499		60	140.0	21,396
6	42.8	207,870		62	143.6	19,909
8	46.4	188,494		64	147.2	18,550
10	50.0	171,165		66	150.8	17,294
12	53.6	155,574		68	154.4	16,133
14	57.2	141,590		70	158.0	15,067
16	60.8	129,000		72	161.6	14,078

7.26.3 GDP Supply and Return Sensor Calibration

European Commission GDP (Good Distribution Practices) guidelines, which are used worldwide, call for the equipment used to control or monitor environments where medicinal products are stored or transported be calibrated in accordance with pharmaceutical shipper specifications, typically every six months or annually.

This procedure explains how to perform a GDP calibration of the supply (STS/SRS) and return (RTS/RRS) sensors using DataLINE software version 3.1 or higher. The calibration procedure should be conducted in pairs (STS/SRS, or RTS/RRS) and it is recommended to calibrate before the full pre-trip inspection.

⚠ WARNING

Before removing the Supply or Return air sensors from the unit, turn the ON/OFF switch and circuit breaker to the OFF position. Disconnect the power plug from the unit. Follow proper lockout/tagout procedures to ensure the power cannot inadvertently be energized. It is important that all dismantling work is done and tools and personnel are away from the unit before powering on the unit for calibration.

⚠ **WARNING**

When performing the Return Air Sensor calibration, disconnect both evaporator motors.

Before proceeding with the calibration procedure, ensure that controller software version is 5368 or higher and DataLINE version 3.1 or higher is installed onto the download device. Only the latest DataLINE and controller software will allow users to carry out Good Distribution Practice (GDP) calibration. Do not downgrade the software after installing the latest software.

Before proceeding with the calibration procedure, it is recommended to check the sensors by running pre-trip P5-0. This test checks the sensor values. If the test fails, identify and correct the faulty sensor and rerun the test.

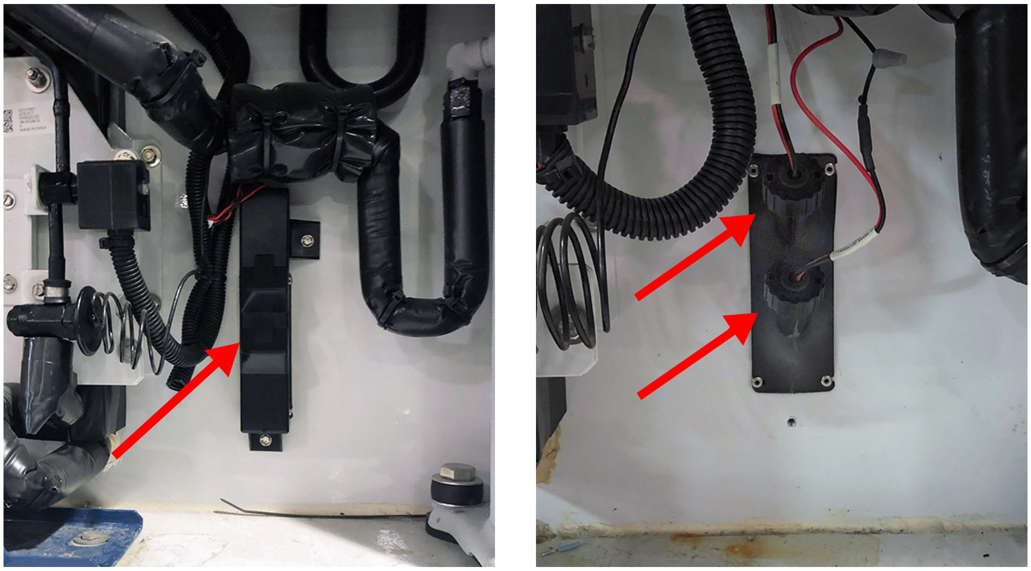
Tools Required:

- Socket screwdrivers set
- Phillips screwdriver
- Standard hand tools
- Interrogator cable
- Laptop with DataLINE 3.1 or above installed
- Clean insulated container for distilled water and ice
- A regularly calibrated reference thermometer, recommended to be of accuracy up to 2 decimal places.

GDP Calibration, Removing Supply Sensors (STS/SRS) from Unit:

1. Locate the supply sensors cover assembly on the suction side of the compressor. Remove the two fasteners securing the cover of the sensors (see **Figure 7.22**).
2. Remove the cover and rotate the supply air sensors, STS/SRS, in a clockwise direction and remove the sensors from the sensor housing (see **Figure 7.22**).

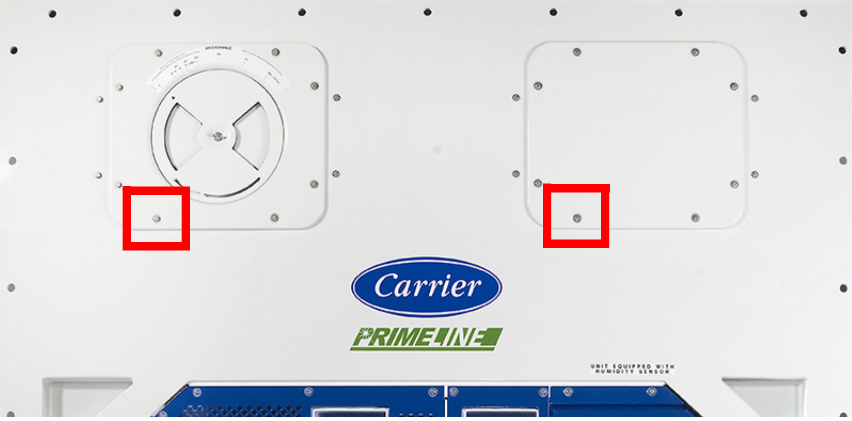
Figure 7.22 Supply Sensors - Cover Assembly and Sensors



GDP Calibration, Removing Return Sensors (RTS/RRS) from Unit:

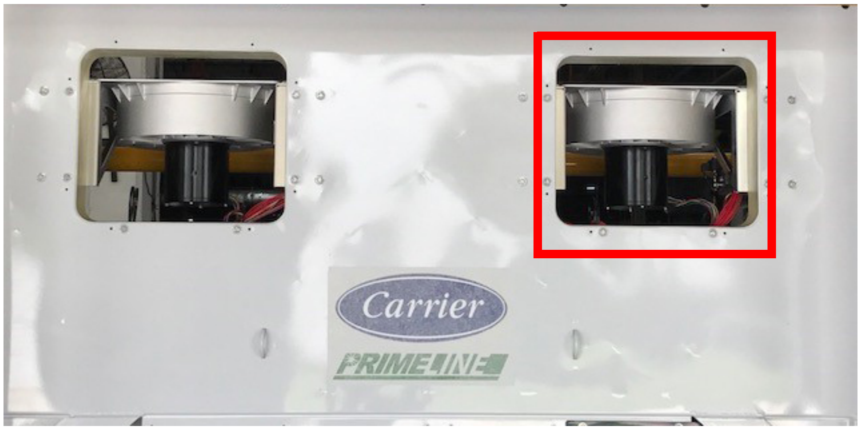
1. Remove both front access panels from the unit by removing 8 fasteners from each panel (see **Figure 7.23**). Save all hardware for re-installation.

Figure 7.23 Removing Front Access Panels



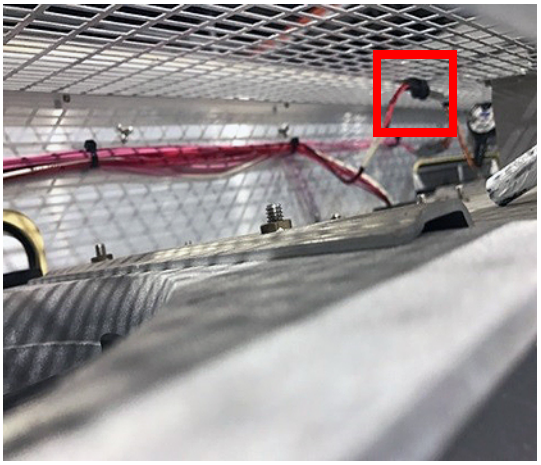
2. On the right side, disconnect the fan motor wiring, loosen the fastener and remove (slide) the evaporator motor from the unit (see **Figure 7.24**).

Figure 7.24 Removing Evaporator Motor



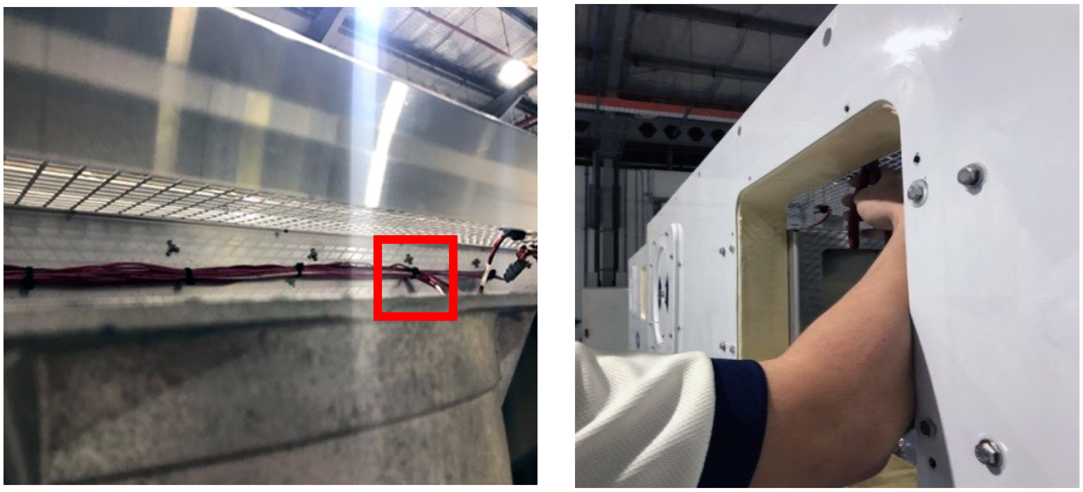
3. Loosen the fastener on the sensor bracket (see **Figure 7.25**).

Figure 7.25 Return Sensors - Bracket



4. Cut all the wire ties (see Figure 7.26) that are securing the sensors to the harness and remove sensor.

Figure 7.26 Return Sensors - Cutting Wire Ties



GDP Calibration, Perform Calibration:

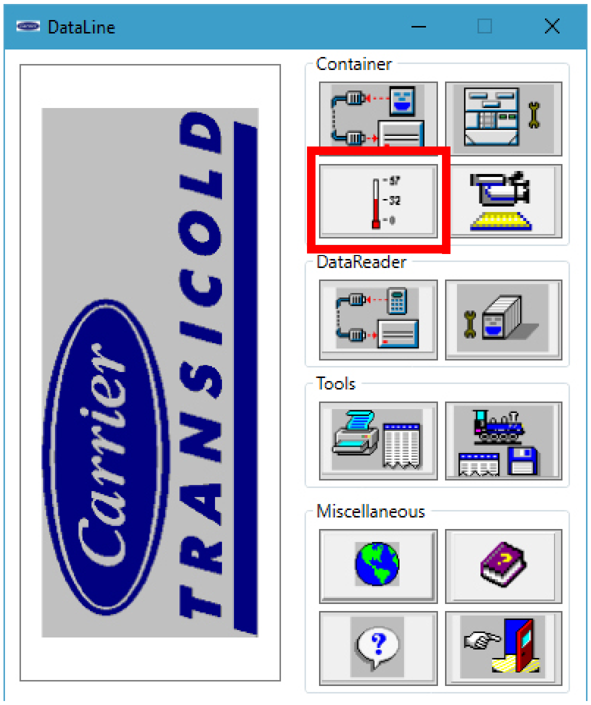
1. Connect the interrogator cable to the interrogator port. Then, power on the unit.

⚠ WARNING

Before powering on the unit, it is important to ensure that all dismantling work is done and tools are away and service personnel are not working on the unit at the time of power on.

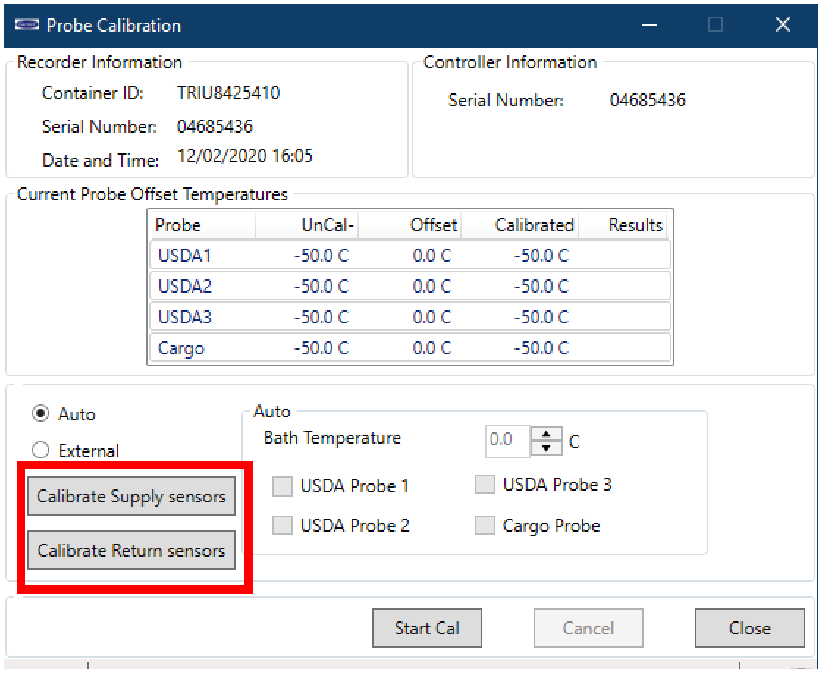
2. Open DataLINE version 3.1 or above. From the DataLINE launch pad, click on the Probe Calibration button (see Figure 7.27) to go to the Probe Calibration screen. A pop-up window will appear reminding the user to ensure proper ice bath temperature. Click OK to acknowledge.

Figure 7.27 DataLINE - Probe Calibration



3. On the Probe Calibration screen, click on the Calibrate Supply sensors or Calibrate Return sensors button (see **Figure 7.28**).

Figure 7.28 DataLINE - Calibrate Sensors Button



Recorder Information

Container ID: TRIU8425410
Serial Number: 04685436
Date and Time: 12/02/2020 16:05

Controller Information

Serial Number: 04685436

Current Probe Offset Temperatures

Probe	UnCal-	Offset	Calibrated	Results
USDA1	-50.0 C	0.0 C	-50.0 C	
USDA2	-50.0 C	0.0 C	-50.0 C	
USDA3	-50.0 C	0.0 C	-50.0 C	
Cargo	-50.0 C	0.0 C	-50.0 C	

● Auto
○ External

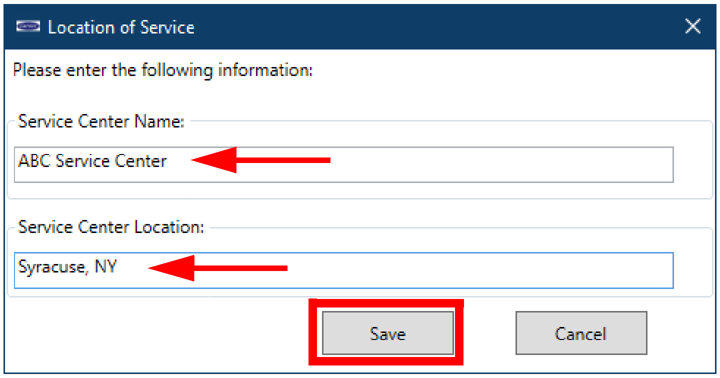
Auto

Bath Temperature 0.0 C

☐ USDA Probe 1
☐ USDA Probe 3
☐ USDA Probe 2
☐ Cargo Probe

4. A Location of Service pop-up window will appear (see **Figure 7.29**). In the appropriate fields, enter the Service Center Name and Service Center Location where the calibration is being performed. Then, click the Save button. A pop-up window will appear reminding the user to ensure proper ice bath temperature. Click OK to acknowledge and remember to maintain the Ice bath at 0°C (32°F).

Figure 7.29 DataLINE - Enter Service Center Information



Please enter the following information:

Service Center Name: ABC Service Center

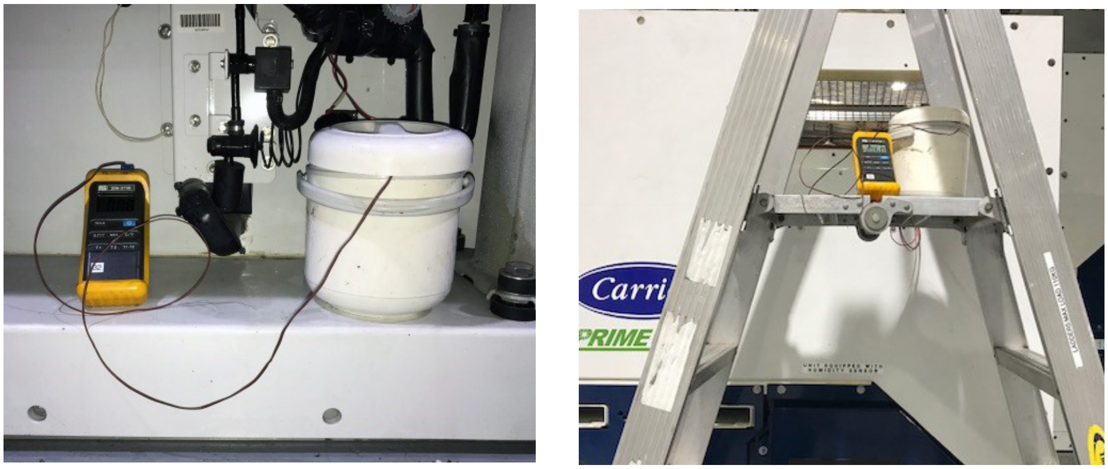
Service Center Location: Syracuse, NY

5. Prepare the ice bath. Refer to the Ice Bath Preparation procedure.

   Ensure that the set-up (i.e. ice bath, sensors, reference thermometer) has reached a stable state before beginning the calibration process. Ensure that the set-up is clean and the reference thermometer is regularly maintained and calibrated.

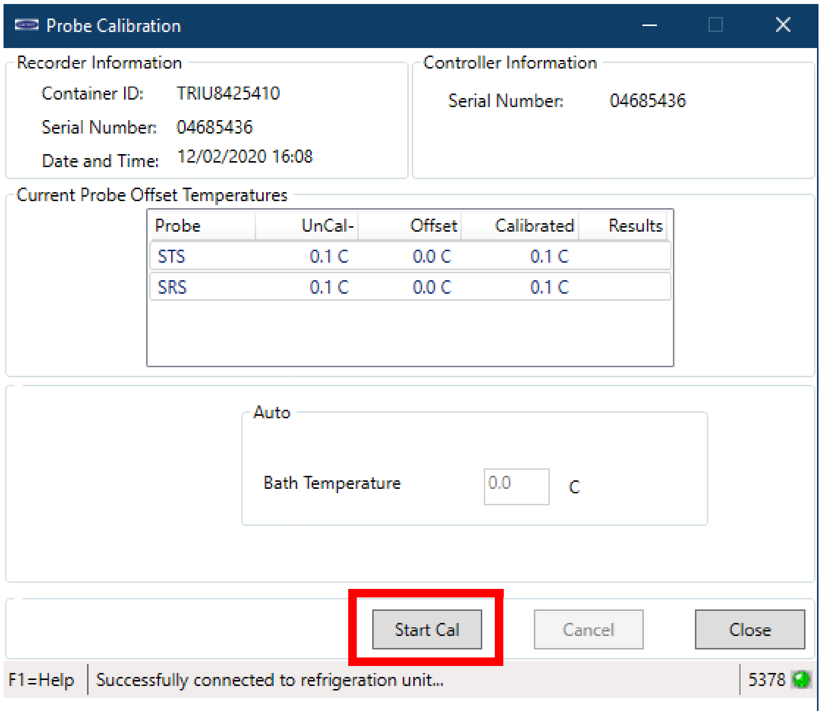
6. Place the ice bath in a location near sensors (see **Figure 7.30**). For Return Sensors, place the ice bath on an elevated platform (ladder) of appropriate height.

Figure 7.30 Ice Bath



7. Once temperature stability is ensured, submerge the sensors in the ice water slurry. Make certain that the sensors do not contact the container sides or bottom, or each other. Continuously stir the slurry mixture during calibration.
8. Ensure that the Ice bath is at 0°C (32°F) using the calibrated reference thermometer. Confirm that the sensor readings have stabilized and the sensors are within +/- 0.3°C (0.5°F). The readings can be taken from the Uncal column in the Current Probe Offset Temperatures table.
9. Then, after confirming the sensor readings have stabilized, click on the Start Cal button (see **Figure 7.31**). After clicking Start Cal, the process begins automatically and will complete in less than 5 minutes. Continue to stir the ice bath during testing. Calibration will fail if the stability cannot be achieved or the sensor offset is greater than 0.3°C (0.5°F).

Figure 7.31 DataLINE - Start Cal Button



Recorder Information

Container ID: TRIU8425410

Serial Number: 04685436

Date and Time: 12/02/2020 16:08

Controller Information

Serial Number: 04685436

Current Probe Offset Temperatures

Probe	UnCal-	Offset	Calibrated	Results
STS	0.1 C	0.0 C	0.1 C	
SRS	0.1 C	0.0 C	0.1 C	

Auto

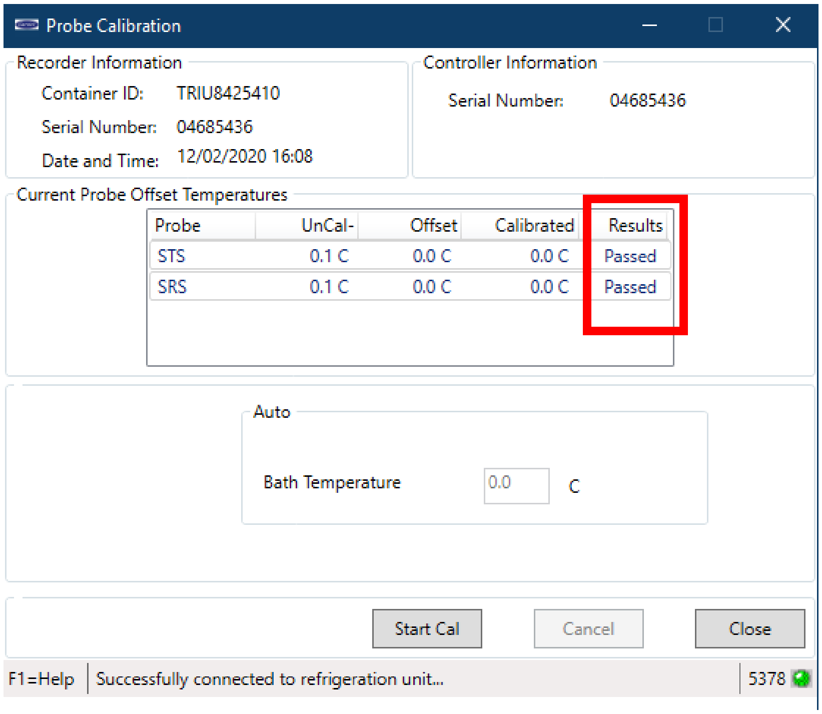
Bath Temperature 0.0 C

F1=Help Successfully connected to refrigeration unit... 5378

10. Once the calibration has completed, a pop-up will appear with the message Calibrate Complete. Click OK to acknowledge and the results will then be displayed on the screen in the Results column (see **Figure 7.32**).

Calibration will fail if the stability cannot be achieved or the sensor offset is greater than 0.3°C (0.5°F). The validity of a sensor can be checked by hand warming the sensors to see if there are changes in the readings on the DataLINE screen. If calibration will not complete, replace and recalibrate the sensors. Refer to the **Sensor Replacement** procedure.

Figure 7.32 DataLINE - Calibration Results



Container ID: TRIU8425410
Serial Number: 04685436
Date and Time: 12/02/2020 16:08

Serial Number: 04685436

Probe	UnCal-	Offset	Calibrated	Results
STS	0.1 C	0.0 C	0.0 C	Passed
SRS	0.1 C	0.0 C	0.0 C	Passed

Bath Temperature 0.0 C

F1=Help | Successfully connected to refrigeration unit... | 5378

11. After completing the calibration event, download a DCX file and check that all of the following information is captured: service center name, location, the results of the calibration and the offset applied. Ensure that all the information is captured and the event is considered a success when all the intended sensors in calibration have passed.

NOTE

If there is “uncal” in the download, it means that the calibration process was not completed.

After the completion of the calibration, restore the unit to its original state.

7.26.4 Sensor Replacement

⚠ WARNING

Always turn OFF the unit circuit breaker (CB-1) and disconnect main power supply before removing electrical parts.

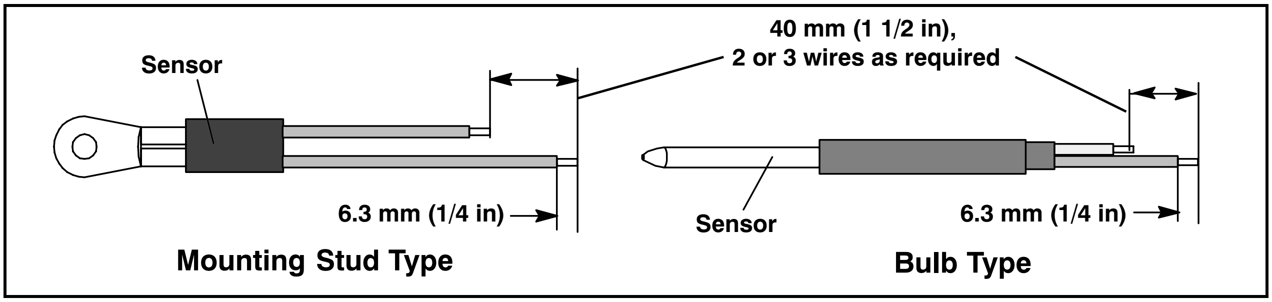
1. Turn unit power OFF and disconnect power supply

NOTICE

Include white date code label when cutting out and removing defective sensors. The label could be required for warranty returns.

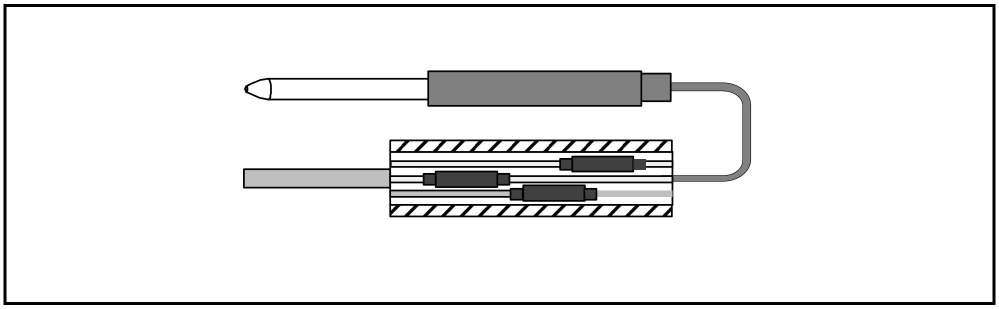
2. Cut cable. Slide the cap and grommet off a bulb type sensor and save for reuse. **Do not cut the grommet**.
3. Cut one wire of existing cable 40 mm (1-1/2 inches) shorter than the other wire.
4. Cut replacement sensor wires (opposite colors) back 40 mm (1-1/2 inches). (See **Figure 7.33**.)
5. Strip back insulation on all wiring 6.3 mm (1/4 inch).

Figure 7.33 Sensor Types



6. Slide a large piece of heat shrink tubing over the cable, and place the two small pieces of heat shrink tubing, one over each wire, before adding crimp fittings as shown in **Figure 7.34**.

Figure 7.34 Sensor and Cable Splice



7. If required, slide the cap and grommet assembly onto the replacement sensor.
8. Slip crimp fittings over dressed wires (keeping wire colors together). Make sure wires are pushed into crimp fittings as far as possible and crimp with crimping tool.
9. Solder spliced wires with a 60% tin and 40% lead Rosincore solder.
10. Slide heat shrink tubing over each splice so that ends of tubing cover both ends of crimp as shown in **Figure 7.34**.
11. Heat tubing to shrink over splice. Make sure all seams are sealed tightly against the wiring to prevent moisture seepage.

⚠ CAUTION

Do not allow moisture to enter wire splice area as this may affect sensor resistance.

12. Slide large heat shrink tubing over both splices and shrink.
13. Position sensor in unit as shown in **Figure 7.34** and re-check sensor resistance:

    Figure 7.36 - Return Sensor Positioning

    Figure 7.35 - Supply Sensor Positioning

    Figure 7.37 - ETS Sensor Positioning

14. Reinstall sensor, refer to:

    Section 7.26.5 - STS and SRS Re-Installation

    Section 7.26.6 - RRS and RTS Re-Installation

    Section 7.26.7 - DTS Re-Installation

    Section 7.26.8 - ETS1 and ETS2 Re-Installation

NOTICE

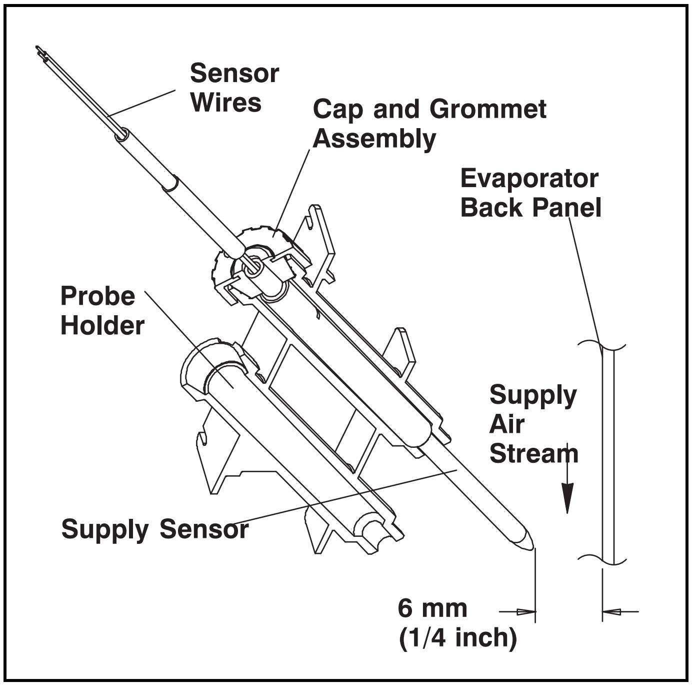
The P5 Pre-Trip test must be run to deactivate probe alarms (refer to Section 5.10).

7.26.5 Sensors STS and SRS Re-Installation

To properly position a unit supply sensor (Supply Temperature Sensor STS or Supply Recorder Sensor SRS), the sensor must be fully inserted into the probe holder. This positioning will give the sensor the optimum amount of exposure to the supply air stream, and will allow the Controller to operate correctly. Insufficient probe insertion into the probe holder will result in poor temperature control due to the lack of air flow over the sensor.

It is also necessary to ensure that the probe tip does not contact the back panel. The design minimum clearance of 6 mm (1/4 inch) should be maintained (see **Figure 7.35**).

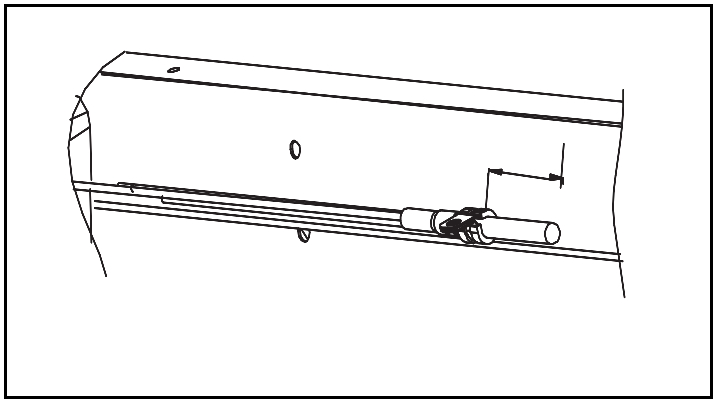
Figure 7.35 Supply Sensor Positioning



7.26.6 Sensors RRS and RTS Re-Installation

Reinstall the return sensor (Return Temperature Sensor RTS or Return Recorder Sensor RRS), as shown in **Figure 7.36**. For proper placement of the return sensor, be sure to position the enlarged positioning section of the sensor against the side of the mounting clamp.

Figure 7.36 Return Sensor Positioning



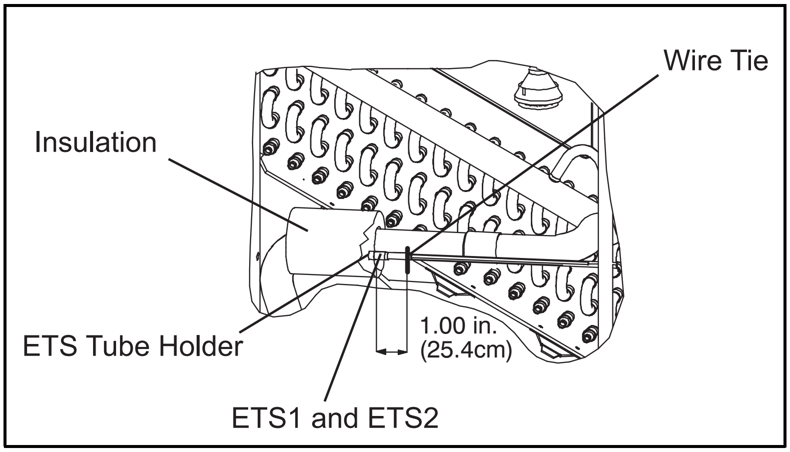
7.26.7 Sensor DTS Re-Installation

The Defrost Temperature Sensor (DTS) must have insulating material placed completely over the sensor to ensure the coil metal temperature is sensed.

7.26.8 Sensors ETS1 and ETS2 Re-Installation

The Evaporator Temperature Sensors, ETS1 and ETS2 are located in a tube holder under insulation, as illustrated in **Figure 7.37**. When the combo sensor is removed and reinstalled, it must be placed in a tube holder by applying thermal grease. Insulating material must completely cover the sensor to ensure the correct temperature is sensed.

Figure 7.37 Evaporator Temperature Sensor Positioning

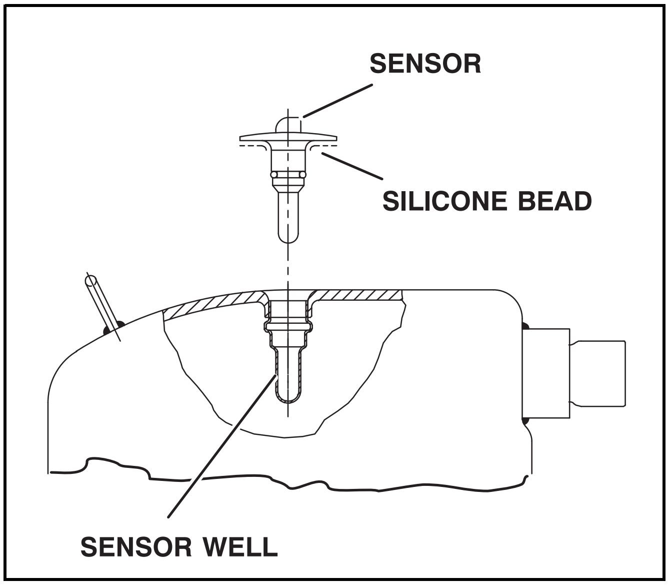


7.26.9 Sensor, CPDS Re-Installation

To replace the Compressor Discharge Temperature Sensor, see **Figure 7.38**:

1. Ensure the unit is disconnected from the power source and that ST is in OFF position.
2. Remove the existing sensor. Clean all silicone sealer and dielectric compound from the sensor well. Ensure well is clean and dry. The top of the compressor, where the sensor seals, must also be clean and dry.

Figure 7.38 Compressor Discharge Temperature Sensor



3. Using the syringe supplied with the replacement sensor, squeeze all of the dielectric compound into the sensor well.
4. Place a bead of the silicone sealer supplied with the replacement sensor around the sensor sealing ring. Insert sensor into the well with the leads parallel to the suction fitting.
5. Reconnect the sensor (see **Figure 7.34**) and run Pre-trip P5.

7.27 Vent Position Sensor (VPS)

The vent position sensor (VPS) determines the position of the fresh air vent in near real-time via the Cd55.

The fresh air vent position sensor alarm (AL50) will occur if the sensor reading is not stable for four minutes or if the sensor is outside of its valid range (shorted or open). This can occur if the vent is loose or the panel is defective. To confirm a defective panel, assure that the wing nut is secure and then power cycle the unit. If the alarm immediately reappears as active, the panel should be replaced.

The alarm should immediately go inactive, check the 4-minute stability requirement. If the alarm reoccurs after the four minutes and the panel was known to have been stable, then the sensor should be replaced.

Upper VPS:

In order to replace the Upper VPS, the panel must be removed and replaced with another upper fresh air panel equipped with VPS.

Upon installation, a new VPS assembly requires calibration as follows:

1. Rotate the vent to the 0 CMH/ CFM position.
2. Cd45 will automatically display. Press the Enter key and hold for five seconds.
3. After the enter key has been pressed the display will read CAL (for calibration).
4. Press the ALT MODE key and hold for five seconds.
5. After the calibration has been completed, Cd45 will display 0 CMH / CFM.

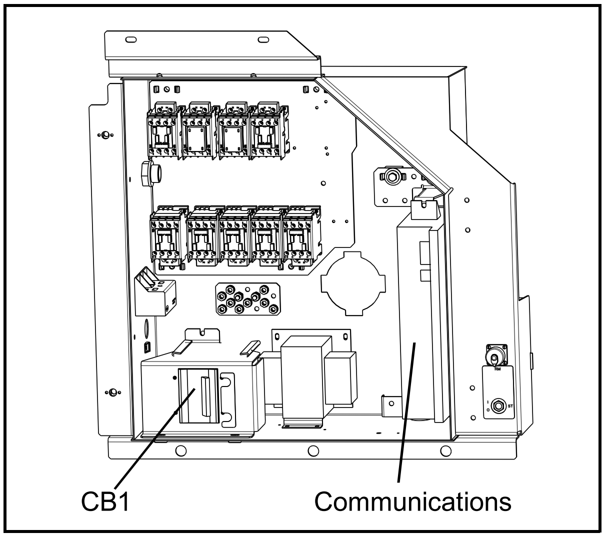
7.28 eAutoFresh Service

7.29 Maintenance of Painted Surfaces

The refrigeration unit is protected by a special paint system against the corrosive atmosphere in which it normally operates. However, should the paint system be damaged, the base metal can corrode. In order to protect the refrigeration unit from the highly corrosive sea atmosphere, or if the protective paint system is scratched or damaged, clean the area to bare metal using a wire brush, emery paper or equivalent cleaning method. Immediately following cleaning, apply paint to the area, and allow to dry. Refer to the Parts List for proper paint selection.

7.30 Communications Interface Module Installation

Figure 7.39 Communications Interface Installation



Units that have been factory provisioned for installation of a Communication Interface Module (CIM) have the required wiring installed. If the unit is not factory provisioned, a provision wiring kit (Carrier Transicold part number 76-00685-00) must be installed. Installation instructions are packaged with the kit.

To Install the Module:

⚠ WARNING

Installation requires wiring to the main unit circuit breaker, CB1. Make sure the power to the unit is off and power plug disconnected before beginning installation.

1. CB1 is connected to the power system, see wiring schematic. Ensure that the unit power is off AND that the unit power plug is disconnected.
2. Open control box, (see **Figure 7.39**) and remove low voltage shield. Open high voltage shield.
3. If using factory provisioned wiring, remove the circuit breaker panel, with circuit breaker, from the control box. Locate, wires CB21/CIA3, CB22/CIA5 and CB23/CIA7 that have been tied back in the wire harness. Remove the protective heat shrink from the ends of the wires.
4. Refit the circuit breaker panel.
5. Fit the new CIM into the unit.
6. Attach three wires CB21/CIA3, CB22/CIA5 and CB23/CIA7 to the CIM at connection CIA.
7. Locate connectors CIA and CIB, remove plugs if required, and attach to the module.
8. Replace the low voltage shield.

Table 7–4 R-134a Refrigerant Pressure Temperature Chart

Note: Underline figures are inches of mercury vacuum

°F	°C	PSIG		°C	°F	BAR
-40	-40.0	14.8		-40	-40.0	-0.49
-38	-38.9	13.9		-39	-38.2	-0.46
-36	-37.8	13.0		-38	-36.4	-0.43
-34	-36.7	12.0		-37	-34.6	-0.40
-32	-35.6	10.9		-36	-32.8	-0.37
-30	-34.4	9.8		-35	-31.0	-0.34
-28	-33.3	8.7		-34	-29.2	-0.30
-26	-32.2	7.5		-33	-27.4	-0.27
-24	-31.1	6.3		-32	-25.6	-0.23
-22	-30.0	5.0		-31	-23.8	-0.20
-20	-28.9	3.7		-30	-22.0	-0.16
-18	-27.8	2.3		-29	-20.2	-0.12
-16	-26.7	0.8		-28	-18.4	-0.07
-14	-25.6	0.3		-27	-16.6	-0.03
-12	-24.4	1.1		-26	-14.8	0.02
-10	-23.3	1.9		-25	-13.0	0.06
-8	-22.2	2.8		-24	-11.2	0.11
-6	-21.1	3.6		-23	-9.4	0.16
-4	-20.0	4.6		-22	-7.6	0.22
-2	-18.9	5.5		-21	-5.8	0.27
0	-17.8	6.5		-20	-4.0	0.33

Table 7–4 R-134a Refrigerant Pressure Temperature Chart

Note: Underline figures are inches of mercury vacuum

°F	°C	PSIG		°C	°F	BAR
2	-16.7	7.5		-19	-2.2	0.39
4	-15.6	8.5		-18	-0.4	0.45
6	-14.4	9.6		-17	1.4	0.51
8	-13.3	10.8		-16	3.2	0.57
10	-12.2	11.9		-15	5.0	0.64
12	-11.1	13.1		-14	6.8	0.71
14	-10.0	14.4		-13	8.6	0.78
16	-8.9	15.7		-12	10.4	0.85
18	-7.8	17.0		-11	12.2	0.93
20	-6.7	18.4		-10	14.0	1.01
22	-5.6	19.9		-9	15.8	1.09
24	-4.4	21.3		-8	17.6	1.17
26	-3.3	22.9		-7	19.4	1.25
28	-2.2	24.5		-6	21.2	1.34
30	-1.1	26.1		-5	23.0	1.43
32	0.0	27.8		-4	24.8	1.53
34	1.1	29.5		-3	26.6	1.62
36	2.2	31.3		-2	28.4	1.72
38	3.3	33.1		-1	30.2	1.82
40	4.4	35.0		0	32.0	1.93
42	5.6	37.0		1	33.8	2.04
44	6.7	39.0		2	35.6	2.15
46	7.8	41.1		3	37.4	2.26
48	8.9	43.2		4	39.2	2.38
50	10.0	45.4		5	41.0	2.50
52	11.1	47.7		6	42.8	2.62
54	12.2	50.0		7	44.6	2.75
56	13.3	52.4		8	46.4	2.88
58	14.4	54.9		9	48.2	3.01
60	15.6	57.4		10	50.0	3.15
62	16.7	60.0		11	51.8	3.29
64	17.8	62.7		12	53.6	3.43
66	18.9	65.4		13	55.4	3.58
68	20.0	68.2		14	57.2	3.73
70	21.1	71.1		15	59.0	3.88
72	22.2	74.1		16	60.8	4.04
74	23.3	77.1		17	62.6	4.21
76	24.4	80.2		18	64.4	4.37
78	25.6	83.4		19	66.2	4.54
80	26.7	86.7		20	68.0	4.72
82	27.8	90.0		21	69.8	4.90
84	28.9	93.5		22	71.6	5.08

Table 7–4 R-134a Refrigerant Pressure Temperature Chart

Note: Underline figures are inches of mercury vacuum

°F	°C	PSIG		°C	°F	BAR
86	30.0	97.0		23	73.4	5.27
88	31.1	100.6		24	75.2	5.46
90	32.2	104.3		25	77.0	5.65
92	33.3	108.1		26	78.8	5.85
94	34.4	112.0		27	80.6	6.06
96	35.6	115.9		28	82.4	6.27
98	36.7	120.0		29	84.2	6.48
100	37.8	124.2		30	86.0	6.70
102	38.9	128.4		31	87.8	6.93
104	40.0	132.7		32	89.6	7.15
106	41.1	137.2		33	91.4	7.39
108	42.2	141.7		34	93.2	7.63
110	43.3	146.4		35	95.0	7.87
112	44.4	151.1		36	96.8	8.12
114	45.6	156.0		37	98.6	8.37
116	46.7	160.9		38	100.4	8.63
118	47.8	166.0		39	102.2	8.90
120	48.9	171.2		40	104.0	9.17
122	50.0	176.5		41	105.8	9.44
124	51.1	181.8		42	107.6	9.72
126	52.2	187.4		43	109.4	10.01
128	53.3	193.0		44	111.2	10.30
130	54.4	198.7		45	113.0	10.60
132	55.6	204.6		46	114.8	10.90
134	56.7	210.6		47	116.6	11.21
136	57.8	216.7		48	118.4	11.53
138	58.9	222.9		49	120.2	11.85
140	60.0	229.2		50	122.0	12.18
142	61.1	235.7		51	123.8	12.51
144	62.2	242.3		52	125.6	12.85
146	63.3	249.0		53	127.4	13.20
148	64.4	255.9		54	129.2	13.56
150	65.6	262.9		55	131.0	13.92
				56	132.8	14.28
				57	134.6	14.66
				58	136.4	15.04
				59	138.2	15.42
				60	140.0	15.82
				61	141.8	16.22
				62	143.6	16.63
				63	145.4	17.04
				64	147.2	17.47

Table 7–4 R-134a Refrigerant Pressure Temperature Chart

Note: Underline figures are inches of mercury vacuum

°F	°C	PSIG		°C	°F	BAR
				65	149.0	17.90

Table 7–5 Recommended Bolt Torque Values (Dry, Non-Lubricated for 18-8 Stainless Steel)

Bolt Diameter	Threads	In-Lb	Ft-Lb	Nm
Free Spinning				
#4	40	5.2	0.4	0.6
#6	32	9.6	0.8	1.1
#8	32	20	1.7	2.3
#10	24	23	1.9	2.6
1/4	20	75	6.3	8.5
5/16	18	132	11	14.9
3/8	16	240	20	27.1
7/16	14	372	31	42
1/2	13	516	43	58.3
9/16	12	684	57	77.3
5/8	11	1104	92	124.7
3/4	10	1488	124	168.1
Non Free Spinning (Locknuts etc.)				
1/4	20	82.5	6.9	9.3
5/16	18	145.2	12.1	16.4
3/8	16	264	22.0	29.8
7/16	14	409.2	34.1	46.2
1/2	13	567.6	47.3	64.1
9/16	12	752.4	62.7	85
5/8	11	1214.4	101.2	137.2
3/4	10	1636.8	136.4	184.9

SECTION 8

ELECTRICAL WIRING SCHEMATIC AND DIAGRAMS

8.1 Introduction

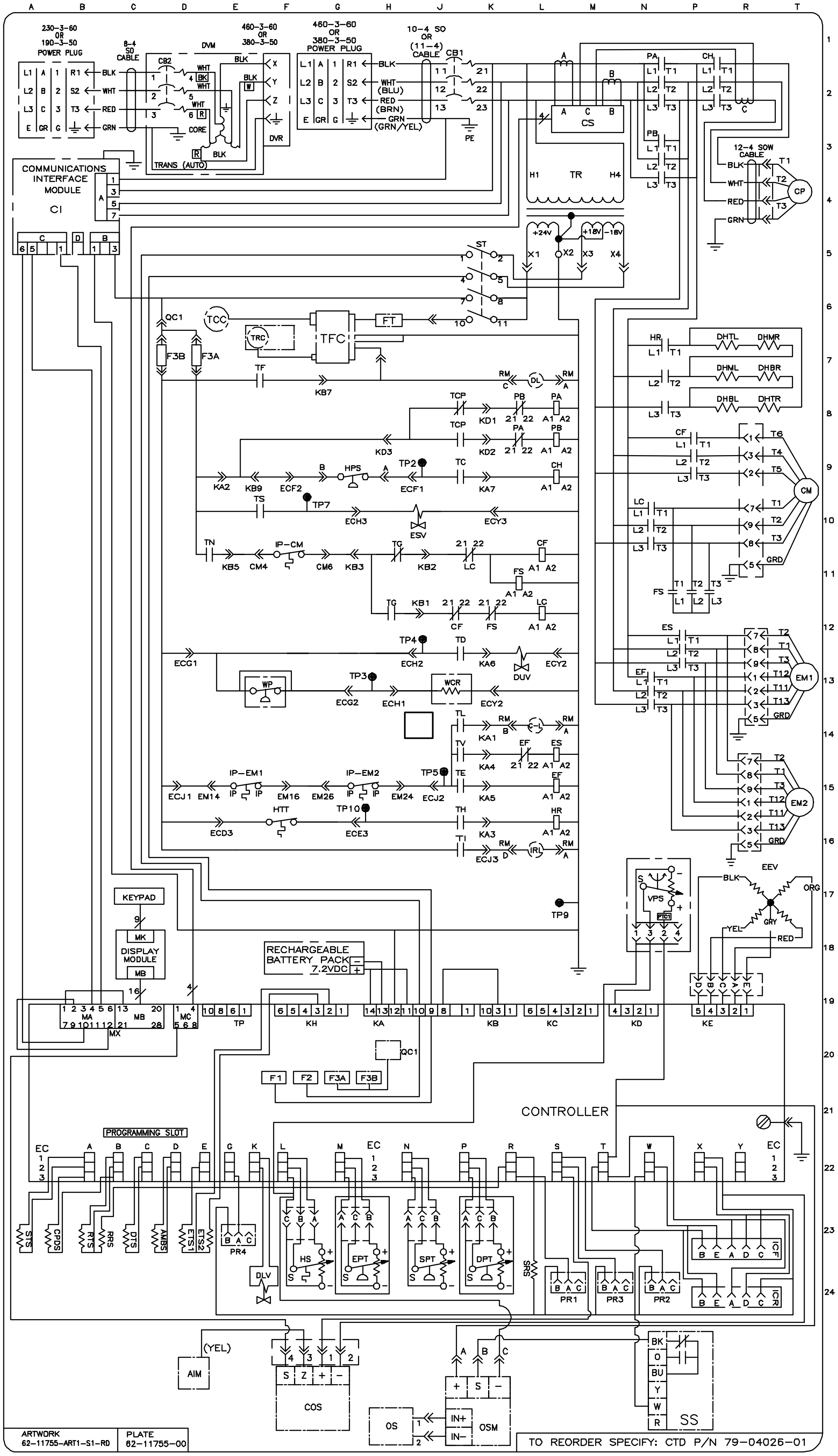
This section contains the Electrical Schematics and Wiring Diagrams.

Figure 8.1 Legend

SYMBOL	DESCRIPTION
AIM	AUTOFRESH INTERFACE MODULE (D–24)
AMBS	AMBIENT SENSOR (C–23)
C	CONTROLLER (L–21)
CB1	CIRCUIT BREAKER – 460 VOLT (J–1)
CB2	OPTIONAL CIRCUIT BREAKER – DVM (OPTION) (D–1) TERMINAL BLOCK WHEN CB2 NOT PRESENT
CF	CONDENSER FAN CONTACTOR (N–8, L–12)
CH	COMPRESSOR CONTACTOR (L–10, P–1)
CI	COMMUNICATIONS INTERFACE MODULE (OPTION) (A–4)
CL	COOL LIGHT (OPTION) (L–14)
CM	CONDENSER FAN MOTOR (E–11, G–12, T–10)
COS	CO2 SENSOR (F–24)
CP	COMPRESSOR MOTOR (T–4)
CPDS	DISCHARGE TEMPERATURE SENSOR (A–23)
CS	CURRENT SENSOR (M–2)
DHBL	DEFROST HEATER – BOTTOM LEFT (R–8)
DHBR	DEFROST HEATER – BOTTOM RIGHT (T–7)
DHML	DEFROST HEATER – MIDDLE LEFT (R–7)
DHMR	DEFROST HEATER – MIDDLE RIGHT (T–7)
DHTL	DEFROST HEATER – TOP LEFT (R–7)
DHTR	DEFROST HEATER – TOP RIGHT (T–8)
DL	DEFROST LIGHT (OPTION) (L–7)
DPT	DISCHARGE PRESSURE TRANSDUCER (K–23)
DTS	DEFROST TEMPERATURE SENSOR (C–23)
DLV	DIGITAL LOADER VALVE (F–24)
DUV	DIGITAL UNLOADER VALVE (L–13)
DVM	DUAL VOLTAGE MODULE (OPTIONAL) (D–1)
DVR	DUAL VOLTAGE RECEPTACLE (OPTIONAL) (F–3)
EEV	EVAPORATOR EXPANSION VALVE (R–16)
EF	EVAPORATOR FAN CONTACTOR–HIGH SPEED (M–15, L–14)
EM	EVAPORATOR FAN MOTOR (T–13, T–15, E–15, F–15, G–15)
EPT	EVAPORATOR PRESSURE TRANSDUCER (H–23)
ES	EVAPORATOR FAN CONTACTOR–LOW SPEED (P–10, L–14)
ETS	EVAPORATOR TEMPERATURE SENSOR (SUCTION) (D–23)
ESV	ECONOMIZER SOLENOID VALVE (J–10)
F	FUSE (C–7, D–7, F–21, G–21)
FS	CONDENSER FAN CONTACTOR (HIGH SPEED SHORTING) (M2)
FLA	FULL LOAD AMPS
HPS	HIGH PRESSURE SWITCH (G–9)
HR	HEATER CONTACTOR (N–7, L–15)
HS	HUMIDITY SENSOR (OPTIONAL) (F–23)
HTT	HEAT TERMINATION THERMOSTAT (E–15)

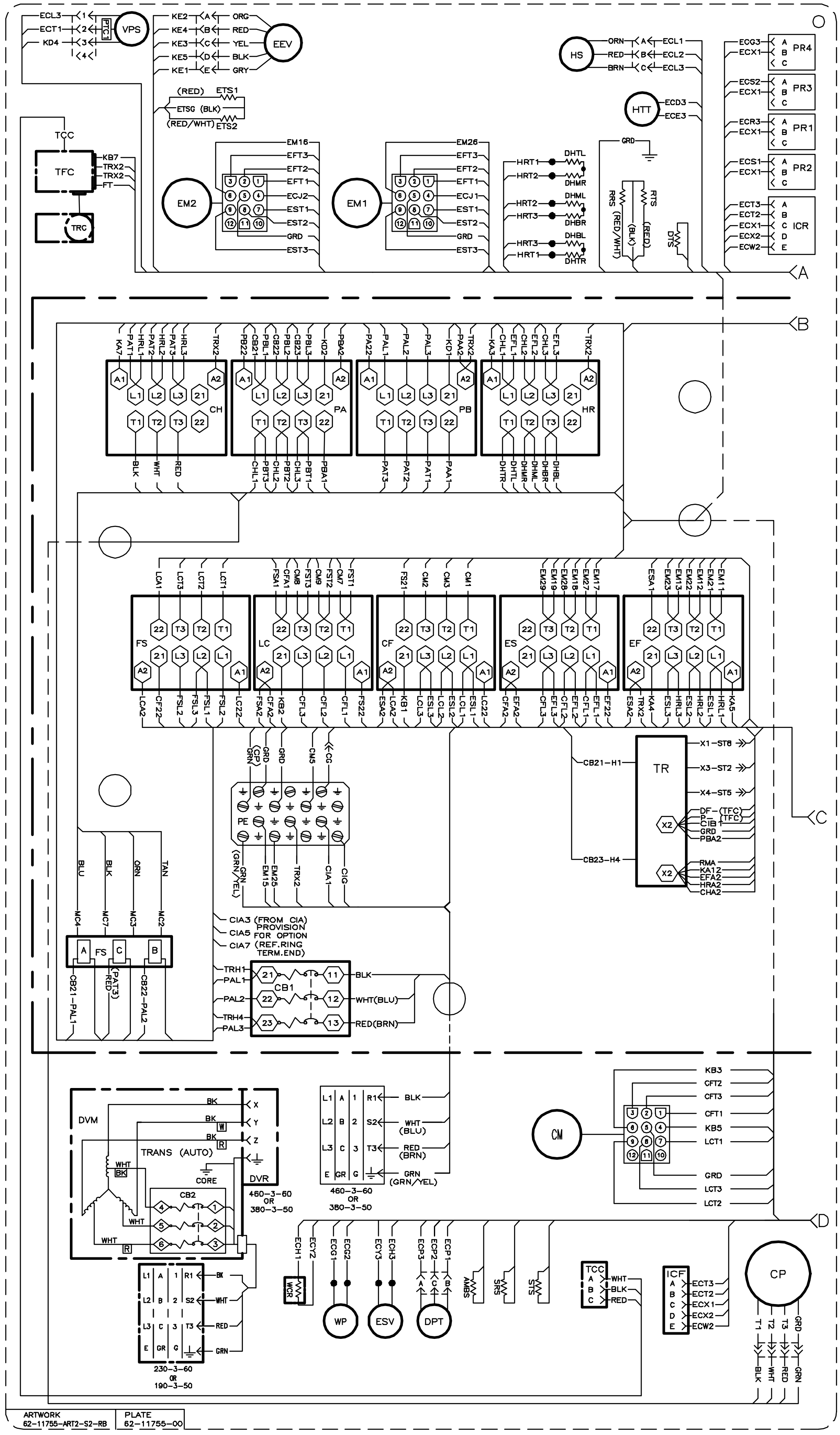
SYMBOL	DESCRIPTION
ICF	INTERROGATOR CONNECTOR FRONT (T–23)
ICR	INTERROGATOR CONNECTOR REAR (T–24)
IP	INTERNAL PROTECTOR (E–14, F–11, G–14)
IRL	IN RANGE LIGHT (OPTION) (K–15)
LC	CONDENSER FAN CONTACTOR (LOW SPEED) (K15)
OS	O2 SENSOR (H24)
OS	O2 SENSOR AMPLIFIER (K24)
PA	UNIT PHASE CONTACTOR (K–8, L–8, N–1)
PB	UNIT PHASE CONTACTOR (K–8, L–8, N–3)
PR	USDA PROBE RECEPTACLE (M–24, N–24, P–24)
PTC1	PTC FOR VENT POSITIONING SENSOR (UPPER) (N–17)
RM	REMOTE MONITORING RECEPTACLE (OPTION) (K–7, L–7, K–14, L–14, K–16, L–16)
RRS	RETURN RECORDER SENSOR (C–23)
RTS	RETURN TEMPERATURE SENSOR (B–23)
SPT	SUCTION PRESSURE TRANSDUCER (H–23)
SRS	SUPPLY RECORDER SENSOR (L–23)
SS	SENSOR SWITCH MODULE (P24)
ST	START – STOP SWITCH (K–5)
STS	SUPPLY TEMPERATURE SENSOR (A–23)
TC	CONTROLLER RELAY–COOLING (J–9)
TCC	TRANSFRESH COMMUNICATIONS CONNECTOR (OPTION) (D–6)
TCP	CONTROLLER RELAY – PHASE SEQUENCING (J–7, J–8)
TD	CONTROLLER RELAY (DUV) (J12)
TE	CONTROLLER RELAY – HIGH SPEED EVAPORATOR FANS (J–15)
TH	CONTROLLER RELAY – HEATING (J–16)
TF	CONTROLLER RELAY – DEFROST (E–7)
TG	CONTROLLER RELAY – (CONDENSER FAN SPEED) (H11)
TI	IN–RANGE RELAY (J–15)
TL	CONTROLLER RELAY – COOL LIGHT (J–14)
TN	CONTROLLER RELAY – CONDENSER FAN (D–10)
TP	TEST POINT (H–9, F–10, H–12, G–13, H–13, G–15, L–17)
TR	TRANSFORMER (M–3)
TRANS	AUTO TRANSFORMER 230/460 (OPTION) (D–3)
TRC	TRANSFRESH REAR CONNECTOR (OPTION) (E–7)
TS	CONTROLLER RELAY – ECONOMIZER SOLENOID VALVE (E–10)
TV	CONTROLLER RELAY – LOW SPEED EVAPORATOR FANS (J–14)
VPS	VENT POSITION SENSOR (UPPER) (N–17)
WCR	WETTING CURRENT RESISTOR (OPTION) (J–13)
WP	WATER PRESSURE SWITCH (OPTION) (E–13)

Figure 8.2 Schematic Diagram



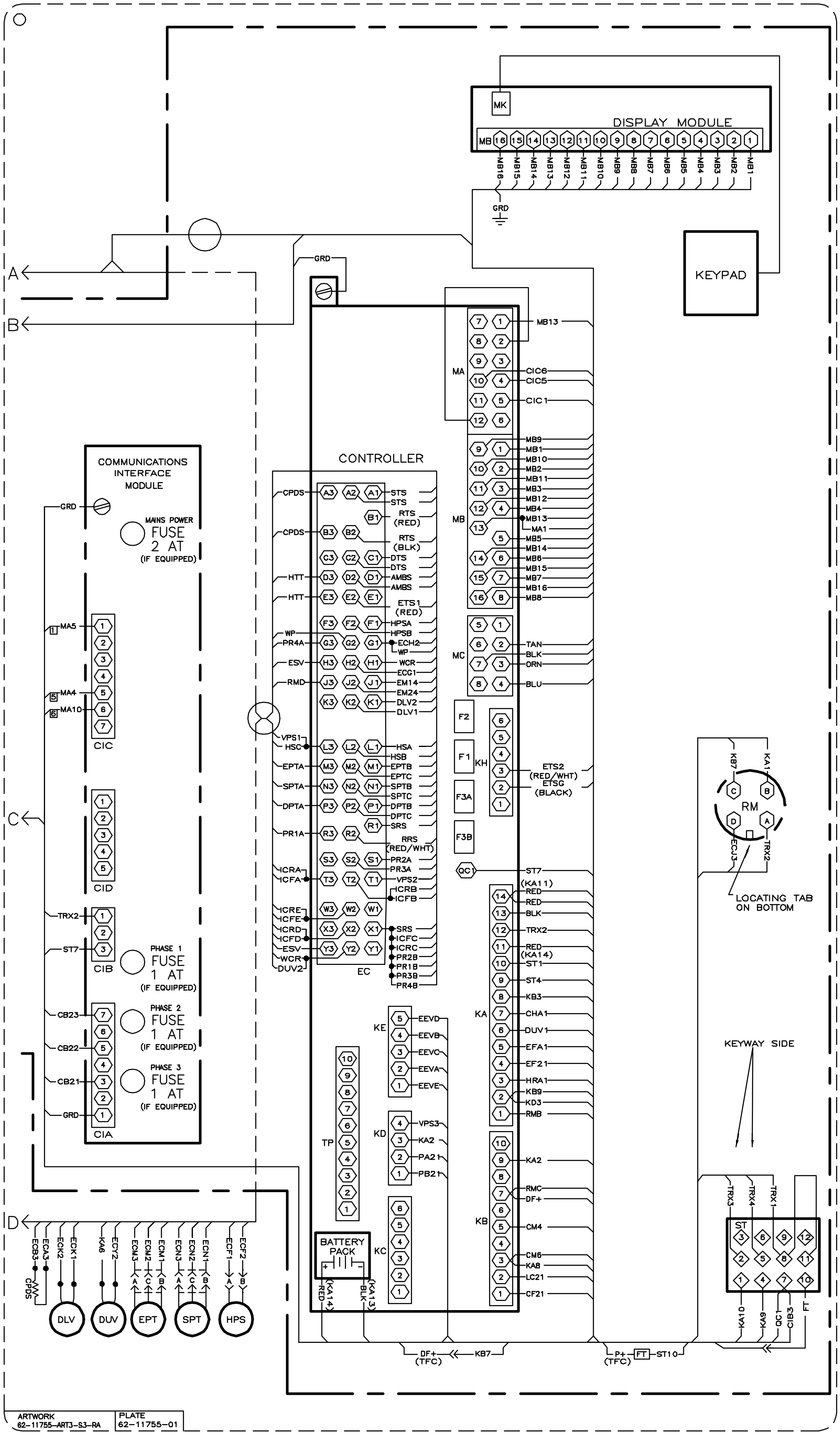
Based on Drawing 62–11755

Figure 8.3 Unit Wiring Diagram Sheet 1



Based on Drawing 62−11755

Figure 8.4 Unit Wiring Diagram Sheet 2



Based on Drawing 62-11755

SECTION 9

Serial Number:
__________-__________
Manufacturing Date:
____

EU DECLARATION OF CONFORMITY

We, manufacturer: Carrier Transicold Pte Ltd
251 Jalan Ahmad Ibrahim
Singapore 629146

Declare, under our sole responsibility, that the PrimeLINE Container Unit:

Model: 69NT40-561

is in conformity with the provisions of the following European Directives:

- Machinery Directive 2006/42/EC following Annex VIII
- Electromagnetic Compatibility Directive 2014/30/EU following Annex II
- Radio Equipment Directive 2014/53/EU Annex II (with select options)

The assembly was assessed for applicability under the Pressure Equipment Directive, 2014/68/EU, but determined to be outside of the scope based on the exclusion indicated in PED Article 1, Paragraph 2.f. The assembly was determined to be no higher than PED Category I and is covered by the Machinery Directive 2006/42/EC.

The following Harmonized Standards were applied for this equipment:

Machinery Directive	EMC Directive	RED Directive (with select option - TripLINK 12LB (CT4000))
EN ISO 12100:2010 EN 60204-1:2006 EN 13857:2008	EN 61000-6-2:2005 EN 61000-6-4:2007+A1:2011 EN55011:2009+A1:2010/CISPR11:2009+A1:2010 EN61000-4-2:2009 EN 61000-4-3:2006,+A1:2008, +A2:2010 EN 61000-4-4:2012 EN 61000-4-5:2006 EN 61000-4-6:2009 EN 61000-4-8:2010 EN 61000-4-11:2004	EN 61000-4-5:2006, EN 60950-1:2006, EN 62368-1:2014, EN 62311:2008, EN301 489-1 v2.1.1, EN 301 489-3 v2.1.1, EN 301 489-7 v1.3.1, EN 301 489-17 v3.2.1, EN 301 489-19 v2.1.1, EN 301 489-20 v2.1.1, EN 301 489-52 v1.1.0, EN 301 511 v12.5.1, EN 301 908-1 v11.1.1, EN 301 908-2 v11.1.2, EN 301 908-13 v11.1.2, EN 303 413 v1.1.1, EN 300 328 v2.2.1, EN 300 220-2 v3.2.1

The following Technical Standards were applied for this equipment:

- ISO 1496-2:2008

Person established in Europe authorized to compile a copy of the Technical File:

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Carrier
TRANSICOLD

China RoHS per SJ/T 11364-2014

产品中有害物质的名称及含量

部件名称	有害物质					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
金属板部件	O	O	O	O	O	O
塑料部件	O	O	O	O	O	O
盘管组件	X	O	O	O	O	O
加热部件	O	O	O	O	O	O
马达，压缩机与风扇组件	O	O	O	O	O	O
温度控制微处理器系统	X	O	O	O	O	O
断路器与接触器	O	O	O	O	O	O
变压器	O	O	O	O	O	O
传感器	X	O	O	O	O	O
通讯组件	O	O	O	O	O	O
阀组件	X	O	O	O	O	O
电缆线/电源	O	O	O	O	O	O
电池	O	O	X	O	O	O
标签与绝缘材料	O	O	O	O	O	O
玻璃部件	X	O	O	O	O	O

本表格依据 SJ/T 11364 的规定编制。
O：表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。
X：表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求。

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https://www.carrier.com/container-refrigeration